Series 1954, No. 10

Issued March 1960

SOIL SURVEY

Lewis County New York

OUR SOIL ★ OUR STRENGTH

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

HOW TO USE THE SOIL SURVEY REPORT

THIS SURVEY of Lewis County will help in planning the kind of farming that will protect the soils and provide good yields. It describes the soils; shows their location on a map; and tells what they will do under different kinds of management.

The soil scientists made both a detailed and a reconnaissance soil survey. The detailed survey covered the central part of the county, and the reconnaissance survey covered the eastern and western parts. In making the reconnaissance survey, the scientists traversed the areas at intervals of ½ to 3 miles. In most places they used roads or trails, but where there were none, they worked their way through the forests. The areas covered in the reconnaissance survey are not shown on the detailed soil map but are shown on the map of soil associations. The section that describes the soil associations is of interest to those who want broad information about the county.

When the scientists made the detailed soil survey, they walked over the fields and woodlands in the central part of the county at intervals ranging from 500 to 1,200 feet. They dug holes and examined surface soils and subsoils; measured slopes with a hand level; noticed differences in growth of crops, weeds, and brush; and, in fact, recorded all the things about the soils that they believed might affect their suitability for farming, forestry, and related uses.

The scientists plotted the boundaries of the soils on aerial photographs. Then, cartographers prepared from the photographs the detailed soil map in the back of this report. Fields, woods, roads, and many other landmarks can be seen on the map.

Locating the soils

Use the index to map sheets to locate areas on the large map. The index is a small map of the county on which numbered rectangles have been drawn to show where each sheet of the large map is located. When the correct sheet of the large map is found, it will be seen that boundaries of the soils are outlined and that there is a symbol for each kind of soil. All areas marked with the same symbol are the same kind of soil, wherever they appear on the map. Suppose, for example, an area located on the map has a symbol BcB. The legend for the detailed map shows that this symbol identifies Bonaparte gravelly sandy loam, 2 to 8 percent slopes. This soil, and all the others mapped in the county, are described in the section, Soil Series and Mapping Units.

Finding information

Some readers will be more interested in one part of the soil report than another. The section, General Nature of the Area, will be of special interest to those not familiar with the county. It tells about the climate and physiography and gives some statistics on agriculture.

Farmers and those who work with farmers will want to read the section, Soil Series and Mapping Units, to learn about the soils in the county and then turn to the section, Management of the Soils. In this way they first identify the soils on their farm and then learn how these soils can be managed and what yields can be expected. The soils are placed in management groups; that is, groups of soils that need similar management and that respond in about the same way. For example, in the section where the soil series and mapping units are described, Adams loamy fine sand, 0 to 3 percent slopes, is shown in management group 23. The management this soil needs therefore will be stated under the heading, Management group 23, in the section, Management of the Soils.

Both the detailed and reconnaissance surveys are part of the technical assistance furnished the Lewis County Soil Conservation District. The fieldwork for the detailed soil survey was completed in November 1954, and, unless specifically stated otherwise, all statements in this report refer to conditions at the time the survey was in progress.

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SOIL SURVEY OF LEWIS COUNTY, NEW YORK

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Report by C. S. PEARSON and MARLIN G. CLINE with a section on forests by EARL L. STONE, Jr., Cornell University Agricultural Experiment Station

Correlation by MARLIN G. CLINE, Cornell University and Soil Conservation Service, and A. J. BAUR, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service, in cooperation with the Cornell University Agricultural Experiment Station

LEWIS COUNTY is on the west side of the Adirondack Mountains and is in the northern part of New York (fig. 1). Physiographically, the county has three sections: (1) The Adirondack foothills on the east, (2) the valley of the Black River in the center, and (3) the Tug Hill Plateau on the west.

The county is irregular in shape. It is bounded on the northeast by St. Lawrence County and on the northwest by Jefferson County. On the east it is bordered by Herkimer County and on the southwest by Oswego County. Oneida County lies to the south and connects the region with the Mohawk Valley.

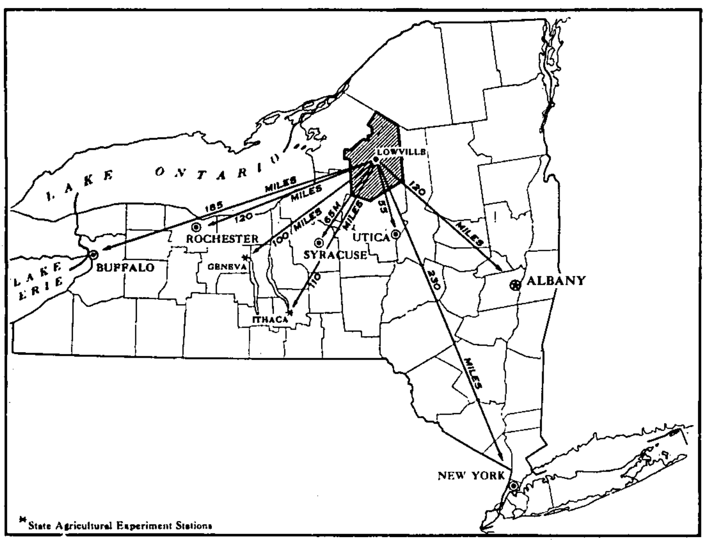

***Figure 1.*—Location of Lewis County in New York.**

In size, the county is 48 miles from north to south and 35 miles from east to west. It has a total area of 832,000 acres, or 1,300 square miles. Lowville, the county seat, is about 230 miles northwest of New York City; 120 miles west-northwest of Albany, the State capital; and 55 miles north-northwest of Utica.

Agriculture and forestry are both important in this county. The agriculture is based on the production and sale of fluid milk. The crops grown are mainly those used to feed the dairy herds and include hay, oats, and corn for silage. Forests cover about two-thirds of the county. They furnish employment during slack seasons, and the sale of forest products adds to the income of many farmers. The forests are also important for recreation, particularly in the area west of the Black River.

Management of the Soils

This section of the report is a general guide to the use and management of the soils of Lewis County. It does not give specific suggestions for managing individual soils. Farmers who would like help in deciding what practices are best suited to the soils of a particular farm may call on the county agent or a local representative of the Soil Conservation Service for advice.

The discussion of management is in four parts: The first describes the principal management practices available to the farmer; the second discusses the capability grouping of the soils; the third describes the general suitability for use and the management needs of groups of soils; and the fourth gives estimates of yields under both common and improved management.

Some Steps to Good Management

The farmer will need to choose the kind of crops he will require for the type of farming he is practicing, and he must choose crops that will grow best on his particular soils. He must also decide on a cropping system and will need to know how much lime and fertilizer are required to obtain the best yields. He will need, in addition, to select supplementary practices to control water on the soils so that the crops will have the water they require without causing the soil to erode. All of these management practices are discussed in the following pages.[1]

Cropping systems

Crops vary in the demands they make on the soil and in their effectiveness in preventing losses of soil through erosion. Inasmuch as row crops usually are removed completely when they are harvested, they are generally considered to be soil depleting because they take a large amount of plant nutrients from the soil. In addition, the soil between the rows is generally left bare after the row crop has been harvested. Even on gentle slopes it is subject to washing, and it may be damaged by wind.

[1] Most of the information on cropping systems and supporting practices is from the 1956 Technical Guide for Lewis County compiled mainly by Mary C. Baltz and Donald F. Flora, soil scientists, Soil Conservation Service. The guide also was used for other information in this section.

Close-growing crops are not so soil depleting as most row crops. They take somewhat smaller amounts of plant nutrients from the soil and protect the soil from erosion while they are growing. They leave the soil exposed, however, during fall, winter, and early spring, although to some extent their roots help to hold the soil until it is again prepared for planting.

Such sod-forming crops as grasses and legumes grown for hay improve the soil. Their roots form a network that helps bind the soil particles together and reduces losses of soil from washing or blowing. The roots also add organic matter and make the soil more porous. The sod-forming crops that contain inoculated legumes—for example, alfalfa, birdsfoot trefoil, and clover—add nitrogen to the soil.

The proportion of sod-forming crops to row crops in a cropping system can be adjusted to provide not only the yields the farmer needs but also protection for his soils. For example, on fertile soils that are not erodible, it is best to grow a high-value row crop after only 1 or 2 years of a sod-forming crop. In this way the farmer makes the most efficient use of the soil improvement provided by the sod crop. For soils that are highly erodible, that are hard to work, or that do not produce good yields of high-value row crops, it is best to grow sod-forming crops for as long as the legumes grow well in the stand. In these areas the hay or pasture can be used for forage to feed dairy cattle and the manure can be used on the soils that are better suited to crops.

The hazard of erosion is greatest where row crops are grown continuously. It is reduced if a row crop is grown for 2 years and is followed by a close-growing crop for 1 year and then by 2 or more years of a sod-forming crop. It is reduced still further by using a cropping system consisting of a row crop for 1 year, a small grain for 1 year, and hay for 2 years.

In the discussion of management groups, the cropping systems are designated by symbols, each symbol representing a crop year. The symbols used are: R=row crop; Rc=row crop with a cover crop; C=close-growing crop; S=sod-forming crop.

Some examples of suitable cropping systems used for the soils of various management groups are:

Rc–Rc–Rc means continuous row crops followed by a cover crop each year. This provides protective cover for the soil about 50 percent of the time.

Rc–Rc–C–S means 2 consecutive years of row crops with a cover crop each year. The row crops are followed by 1 year of a close-growing crop and 1 year of a sod-forming crop. This provides protective cover about 60 percent of the time.

R–C–S–S means 1 year of a row crop, 1 year of a close-growing crop, and 2 years of a sod-forming crop. This provides protective cover about 70 percent of the time.

R–C–S–S–S means 1 year of a row crop, 1 year of a close-growing crop, and 3 or more years of a sod-forming crop. The sod-forming crop remains on the soil until the legume in the stand fails, or weeds encroach, and make it advisable to plow and repeat the rotation. This provides protective cover about 80 to 90 percent of the time.

C–S–S–S means 1 year of a close-growing crop and 3 or more years of a sod-forming crop. The sod-forming crop remains on the soil until the stand becomes depleted. The area is then plowed, and the sod-forming crop is reseeded with a small grain as a companion crop the first year. This provides protective cover about 90 to 95 percent of the time.

Generally, any of the cropping systems listed can be used on the nearly level soils along with appropriate supplementary practices to maintain fertility. On these nearly level soils, the farmer needs only consider the rotation that will best fit his requirements. On the more sloping soils, however, the risk of erosion may be the determining factor in choosing a cropping system. Here, at least 2 years of sod-forming crops in a 4-year rotation may be needed.

The cropping systems best suited to a particular soil and the special practices needed to control water or wind erosion are listed, where required, in the table that accompanies each management group.

Lime and fertilizer

Cropping systems will not be effective if the soils lack lime and nutrients that will help plants to make a vigorous growth. The general requirements for lime and for fertilizer are discussed in this section. Suggestions for supplying lime and fertilizer needs are not specific. They differ according to crops and past treatment, and they may change as new information becomes available. They should be adjusted according to current soil tests and past practices.

Lime.—The need for lime varies widely among the soils of Lewis County. It depends upon the degree of acidity and the texture and past use of the soil. The farmer should have his soils tested to determine their need for lime. Lime can be applied according to current recommendations for each crop. If initial needs are greater than 2 tons per acre, half should be applied and plowed down. The other half will then be applied on the surface. It may take several years to completely satisfy the initial need for lime. The table in each management group can be used to determine the approximate amount needed for a given change in the pH of a soil. The terms used in the report to describe the ability of the soil to supply lime are:

(1) HIGH means that the soil is naturally rich in lime; free lime occurs at depths of 2 to 3 feet, and the soil material above the lime is neutral or only slightly acid. Such soils have little or no need for lime. Many of the soils in the central valley in the areas of limestone and calcareous shale are of this kind. These soils need 0 to 1 ton of ground limestone per acre to correct the initial acidity of the plow layer. Every 4 or 5 years they require a like amount of limestone to maintain a pH of 6.5 in the plow layer so that legumes will grow well.

(2) MEDIUM means that at depths of 30 to 40 inches there is free lime or that the soils are alkaline. Because of extensive leaching, however, the soils are strongly or very strongly acid above these depths. Soils of this kind were formed from materials moderately rich in lime. They occur mainly near the edges of the limestone region. These soils need 2 to 6 tons of ground limestone per acre to correct the initial acidity of the plow layer. Every 4 or 5 years they will need an additional 1 to 1½ tons of limestone to maintain a pH of 6.5, which is required for shallow-rooted crops and to start new seedings of deep-rooted legumes.

(3) Low means the soil is strongly to very strongly acid throughout the rooting zone. Most of the soils east of the Black River and on the Tug Hill Plateau west of the river are of this kind. These soils need initial applications of 2 to 6 tons of ground limestone per acre to correct the acidity of the plow layer. Every 4 or 5 years, they will require an additional 1 to 1½ tons of limestone to maintain the pH necessary for good growth of perennial legumes.

Nitrogen.—Almost all of the total nitrogen reserve in the soil is held in the organic matter. The total content of organic matter is, therefore, a good measure of the reserve of nitrogen in the soils. Nevertheless, it is not of itself a good measure of the amount of nitrogen that will be released for crops, or of when it will be released.

Nitrogen becomes available to crops only when the organic matter in the soil decomposes. In cold, wet soils the organic matter decomposes slowly. Consequently, although poorly drained soils generally contain more organic matter than well-drained soils, they do not release much nitrogen early in the growing season. In Lewis County all of the soils remain cold until June, or later, so that even the well-drained soils are deficient in nitrogen for most early crops.

Little available nitrogen is carried over in the soil from one season to the next. It is either taken up by plants or is lost through leaching. Nitrogen fertilizer must, therefore, be applied annually. Although manure may be used to supply nitrogen, additional nitrogen fertilizer generally is required for good yields. The minimum application for corn, oats, and grass for hay is 20 to 30 pounds of nitrogen per acre, which is equivalent to 60 to 90 pounds of ammonium nitrate or the nitrogen in 200 to 300 pounds of 10–10–10 fertilizer. Legumes that have been inoculated properly require no nitrogen.

Phosphorus.—The soils of Lewis County are low to medium in phosphorus. Part of the reserve of phosphorus is held in the organic matter, but most of it is in the mineral part of the soil. The phosphorus is released too slowly to provide the amounts needed for crops to grow well. Phosphate is needed on almost all the soils of the county. It is not leached out readily, however, so it is not necessary to apply it every year. Enough can be applied at one time to supply the needs of 3 years of field crops.

Because phosphate stays in the soil a long time, past management is important in deciding how much is needed. It is a common practice on dairy farms to spread superphosphate on the stable floors at the rate of 1 or 2 pounds per cow per day. This is mixed with the manure that is spread on the fields. If this practice has been followed for a long time and if the manure has been liberally applied, reserves of phosphorus may have accumulated so that crops do not need additional amounts. This surplus may last several years, but when phosphate is no longer added, the soils again will gradually become deficient in phosphorus.

Large reserves of phosphorus may accumulate in soils that have been fertilized annually for a long period with 100 pounds or more of phosphate per acre. On soils so fertilized, common field crops and hay show little response if additional phosphate is applied. Nevertheless, with the increasing use of nitrogen and higher yields, the need for phosphate may become greater. Also, on very acid soils, the availability of phosphorus is usually increased by liming. The soils should be tested to determine the amount of phosphorus in reserve.

Except for soils that have already received large amounts, the soils generally require each year phosphorus equivalent to that in 100 to 150 pounds per acre of 20-percent superphosphate. This can be applied in manure or in commercial fertilizer.

Potassium.—The soils of Lewis County range from very low to high in available potassium. In the Rhinebeck, Buxton, and other fine-textured soils, the supply of potassium is generally large enough so that not much benefit is derived from adding more except for the starter effect of small amounts placed near the seed. At the other extreme, the Adams, Colton, and other coarse-textured soils do not supply enough potassium for moderate yields of the crops commonly grown. Some of the medium-textured soils, for example, the Nellis and Herkimer, release enough potassium for moderate yields of crops that do not require large amounts of potash. They do not release enough for good yields of crops that have a high potassium requirement. On these soils supplemental potash is needed, as well as on the coarse-textured, sandy soils.

Potassium is lost from the soils more rapidly than phosphorus. Consequently, potash should be applied in small amounts each year, or every 2 years, rather than in large amounts. Manure commonly contributes about 4 to 6 pounds of potash for each ton applied. The potash is mainly in the liquids and is almost all available to plants the first year. In determining the amount of potash to use, the amount applied in manure is subtracted from the total amount of potash required. The availability of potash in the soil is generally decreased by liming.

The soils should be tested to determine the amount of potash available. This information can be used along with current recommendations to determine the amount of potash needed for different crops. The table in each management group shows the ability of each soil to supply potassium.

Supplementary practices to control water

In addition to suitable cropping systems and proper amounts of lime and fertilizer, many of the soils require practices to conserve water, to remove excess water, and to control erosion.

Although Lewis County is in a humid region, lack of water during the growing season limits the growth of crops. Because of rapid runoff in many places, little water penetrates into the soil to depths where it can be used by plant roots, and little is stored for future use. The rapid runoff also contributes to erosion. Special devices or practices needed to control runoff on each soil are listed in the table in each management group. Those most frequently used are defined as follows:

Check dam. A small, low dam constructed in a gully or other watercourse to decrease the velocity of stream flow.

Cover crop. A close-growing crop seeded with a row crop, primarily for the purpose of protecting and improving the soil.

Diversion terraces. Small earthen embankments, which have just above them a shallow channel that curves around the slope at a gentle gradient. These divert the water so that it runs slowly in the channel along the slope to a safe outlet rather than running straight down

the slope; on cultivated soils diversion terraces are commonly used in combination with stripcropping; on wet, sloping soils *drainage diversions* should be cut into the soil to intercept seepage water.

Sod waterways. A permanent sod crop in natural drainageways where water accumulates on slopes and would otherwise cause serious erosion.

Stripcropping. Growing crops in a systematic arrangement of alternate strips of row crops, close-growing crops, and sod-forming crops on the contour. In effect, it breaks a long slope into several short slopes. Each strip of sod crop protects the strip of row crop below, and each strip of close-growing or sod-forming crop catches the soil washed from the strip above it. *Graded strips* should be used on soils that are both wet and sloping. In these the crops are grown in strips, but the strips grade toward a protected waterway.

Tillage across the slope or on the contour. Working the soil at right angles to the direction of the slope so that the rate of runoff is reduced; consequently, more of the water sinks into the soil.

DRAINAGE.—Many of the soils of Lewis County are not productive or cannot be used for crops because of poor drainage. Some of the poorly drained soils are in depressions where runoff and seepage waters accumulate. Others occur on slopes and are kept wet by seepage water that accumulates above a slowly permeable subsoil. Still other soils occupy large areas that are only slightly sloping, so that excess water moves away very slowly. Unless artificial drainage is provided, the poorly drained soils are too wet for crops, even in years of normal precipitation.

Most of the poorly drained soils used for crops have been drained artificially to some extent. Much of this drainage is indirect—partly through roadside ditches, but mostly through open ditches. The estimated yields given for these soils in table 44, in the section, Estimated Yields, are for poorly drained soils after they have been partly drained and are not for such soils under natural drainage.

The technical problems of providing artificial drainage systems (*6*)[2] cannot be discussed in this report. In each management group, however, there is a discussion of the range of drainage of the soils. A competent engineer should be consulted to determine whether or not a given field can be drained effectively. After the farmer has obtained this information and also estimates of cost, he must decide whether or not the cost of draining a particular field will be justified.

Capability Groups of Soils

Capability grouping is a system of classification used to show the relative suitability of soils for crops, grazing, forestry, and wildlife. It is a practical grouping based on the needs and limitations of the soils, on the risk of damage to them, and also on their response to management. There are three levels above the soil mapping unit in this grouping. They are the capability unit, subclass, and class.

The capability unit, which can also be called a management group of soils, is the lowest level of capability grouping. A capability unit is made up of soils that have similar management needs, risks of damage, and general suitability for use.

The next broader grouping, the subclass, is used to indicate the dominant kind of limitation. The letter symbol "e" indicates that the main limiting factor is risk of erosion if the plant cover is not maintained; "w" means excess water that retards plant growth or interferes with cultivation; "s" shows that the soils are shallow, droughty, or unusually low in fertility. In some parts of the country there is another subclass, "c", for the soils that are limited chiefly by a climate that is too cold or too dry.

The broadest grouping, the land capability class, is identified by Roman numerals. All the soils in one class have limitations and management problems of about the same degree, but of different kinds, as shown by the subclass. All the land classes except class I may have one or more subclasses.

In classes I, II, and III are soils that are suitable for annual or periodic cultivation of annual or short-lived crops.

Class I soils are those that have the widest range of use and the least risk of damage. They are level, or nearly level, productive, well drained, and easy to work. They can be cultivated with almost no risk of erosion and will remain productive if managed with normal care.

Class II soils can be cultivated regularly but do not have quite so wide a range of suitability as class I soils. Some class II soils are gently sloping; consequently, they need moderate care to prevent erosion. Other soils in class II may be slightly droughty or slightly wet, or somewhat limited in depth.

Class III soils can be cropped regularly but have a narrower range of use. These need even more careful management.

In class IV are soils that have greater natural limitations than those in class III, but they can be cultivated for some crops under very careful management.

In classes V, VI, and VII are soils that normally should not be cultivated for annual or short-lived crops, but they can be used for pasture or range, as woodland, or for wildlife.

Class V soils (none in Lewis County) are nearly level and gently sloping but are droughty, wet, low in fertility, or otherwise unsuitable for cultivation.

Class VI soils are not suitable for crops because they are steep or droughty or otherwise limited, but they give fair yields of forage or forest products. Some soils in class VI can, without damage, be cultivated enough so that forest trees can be set out or pasture crops seeded.

Class VII soils provide only poor to fair yields of forage or forest products and have characteristics that limit them severely for these uses.

In class VIII are soils that have practically no agricultural use. They have value as watersheds, and some have value as wildlife habitats or for scenery.

CAPABILITY CLASSES, SUBCLASSES, AND MANAGEMENT GROUPS

Class I.—Deep, nearly level, productive soils; suitable for tilled crops and other uses; few or no permanent limitations.

Management group:

1. Deep, well-drained, nearly level soils.
2. Deep, sandy, well-drained, nearly level soils.

[2] Italic numbers in parentheses refer to Literature Cited, p. 107.

Class II.—Soils that have moderate limitations if tilled; suitable for crops, pasture, and trees.

Subclass IIe.—Soils that have moderate risk of erosion if cover is not maintained.

Management group:

3. Deep to moderately deep, gently sloping soils.
4. Deep, nearly level and gently sloping sandy loams and fine sandy loams.
5. Deep, gently sloping, very strongly acid soils.
6. Deep, nearly level and gently sloping, moderately slowly permeable soils.
7. Moderately well drained to somewhat poorly drained, gently sloping soils.
8. Moderately well drained to somewhat poorly drained, level to gently sloping soils.
9. Nearly level to gently sloping soils that have slowly permeable subsoils.
10. Gently sloping soils that have fragipans below 16 to 21 inches.

Subclass IIw.—Soils that have moderate limitations because of excess water.

Management group:

11. Well-drained soils on flood plains.
12. Moderately well drained to somewhat poorly drained soils on flood plains.
13. Moderately well drained to somewhat poorly drained soils on glacial till or lake-laid materials.

Class III.—Soils that have severe limitations and require careful management if tilled; suitable for crops, pasture plants, and trees.

Subclass IIIe.—Soils that have severe risk of erosion.

Management group:

14. Well-drained, sloping soils.
15. Well-drained to excessively drained, sloping or rolling soils.
16. Well-drained, sloping, strongly acid soils.
17. Highly erodible, very strongly acid soils.
18. Sloping soils underlain by a strong pan or clayey subsoil.
19. Poorly drained to somewhat poorly drained, gently sloping soils.

Subclass IIIw.—Soils that have severe limitations because of excess water.

Management group:

20. Nearly level, somewhat poorly drained soils.
21. Nearly level, somewhat poorly drained and poorly drained soils.
22. Nearly level, very poorly drained soils.

Subclass IIIs.—Soils that have severe limitations because of unfavorable depth or texture.

Management group:

23. Well-drained to excessively drained soils.
24. Sloping or rolling droughty soils.
25. Moderately well drained, nearly level or undulating, very sandy soils.

Class IV.—Soils that are suited to pasture or trees but if tilled are suitable for only limited or occasional cultivation and with very severe limitations.

Subclass IVe.—Soils that have very severe risk of erosion.

Management group:

26. Well-drained, steep soils.
27. Well-drained to somewhat excessively drained soils.
28. Well drained to moderately well drained, acid, steep soils.
29. Well-drained, acid, highly erodible soil.

Subclass IVw.—Soils that have very severe limitations because of excess water.

Management group:

30. Poorly drained to very poorly drained soils with a moderately fine textured subsoil.
31. Nearly level, poorly drained to somewhat poorly drained soils on flood plains.
32. Poorly drained to somewhat poorly drained soils in which bedrock occurs at depths of 10 to 30 inches.
33. Very poorly drained soils.

Subclass IVs.—Soils that have very severe limitations of unfavorable depth or texture.

Management group:

34. Gently sloping and sloping, shallow soils.

Class VI.—Soils that have moderate limitations for pasture plants or trees but are not suited to tilled crops except under careful management.

Subclass VIe.—Soils moderately limited for pasture plants or trees because of risk of erosion.

Management group:

35. Steep or very steep soils of moderate to high fertility.

Subclass VIw.—Soils moderately limited for pasture plants or trees because of excess water.

Management group:

36. Very poorly drained soils subject to frequent flooding.

Subclass VIs.—Soils moderately limited for pasture plants or trees because of unfavorable depth, texture, or stoniness.

Management group:

37. Shallow or ledgy soils.
38. Gently sloping to sloping, very stony soils.
39. Poorly drained or very poorly drained, stony or shallow soils.

Class VII.—Soils severely limited for pasture plants or trees.

Subclass VIIw.—Soils severely limited for pasture plants or trees because of excess water.

Management group:

40. Wet peats and mucks.

Subclass VIIs.—Soils severely limited for pasture plants or trees because of unfavorable texture or depth.

Management group:

41. Stony or shallow soils, rough broken land, or rockland.
42. Sandy or gravelly, droughty soils.
43. Wet, extremely stony soils.

Class VIII.—Soils not suitable for producing plants in commercial quantity.

Management group:

44. Fresh water marsh and riverwash.

Unclassified.—Made land; some areas are tillable, others are unsuited to vegetation.

Management Groups

For the purpose of discussing management requirements, the soils of Lewis County have been placed in 44 management groups. All the soils in any one group are similar in use suitability and management needs. For

TABLE 1.—*Soils of management group 1, their ability to supply lime and potassium, lime needed at different pH values' cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Herkimer silt loam, acid, 0 to 3 percent slopes	Medium.	Low.	5. 0	3. 5–4. 0	4. 5–5. 0	5. 0–5. 5
Herkimer silt loam, neutral, 0 to 3 percent slopes	Medium.	High.	5. 5	2. 0–2. 5	2. 5–3. 0	3. 0–3. 5
Howard loam, 0 to 3 percent slopes	Medium.	Medium.	6. 0	----------	1. 0–1. 5	1. 5–2. 0
Kars gravelly loam, 0 to 3 percent slopes	Medium.	High.				

Cropping systems [2]	Supporting practices
Rc–Rc–Rc	Cross-slope cultivation, mainly on Herkimer soils.
Rc–Rc–C–S	Cross-slope cultivation, mainly on Herkimer soils.
R–C–S	Cross-slope cultivation, mainly on Herkimer soils.
R–C–S–S	Not needed.
R–C–S–S–S	Not needed.
C–S–S–S	Not needed.
S–S–S–S	Not needed.

[1] For definitions, see section, Some Steps to Good Management.

[2] Rc=row crop with a cover crop; C=close-growing crop; S=sod-forming crop; R=row or intertilled crops.

each group there is a table listing the soils in the group as well as facts about lime and potash, cropping systems, and supporting practices. The information in this section is not specific but is a general guide for the use, management, and conservation of the soils of the county.

The only unclassified soil mapping unit in the county, Made land, was not placed in a management group. The areas are made up of excavations, fills, and dumps. Some of them can be cultivated; others are unsuitable for plants.

Class I

Deep, nearly level, productive soils; suitable for tilled crops and other uses; few or no permanent limitations.

MANAGEMENT GROUP 1

Deep, well-drained, nearly level soils.

This management group consists of deep, well-drained, nearly level soils. The soils range from moderate to high in available moisture-holding capacity and ability to hold plant nutrients. Within the group, the two Herkimer soils have the highest available moisture-holding capacity and retain plant nutrients the best. The Howard and Kars soils have a gravel substratum and are more droughty than the Herkimer soils.

All of these soils respond well to good management. The soils in the group are listed in table 1 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group all have a moderate supply of plant nutrients. They should be tested to determine the specific amounts of phosphate and potash they require. Generally, these soils need about the same amounts of fertilizer as suggested for soils of average fertility.

Lime needs.—Except for Herkimer silt loam, acid, 0 to 3 percent slopes, all of the soils of this group have lime within reach of plant roots. The plow layers of Herkimer silt loam, neutral, 0 to 3 percent slopes, and Kars gravelly loam, 0 to 3 percent slopes, have a pH of 6.0 or more. Tests are needed to determine the specific requirements for lime.

Suitability for crops and pastures.—The soils of this group are well suited to all the crops normally grown in Lewis County. Potatoes grown on the Kars soil and on the neutral phase of the Herkimer soil, however, may be subject to potato scab. The Howard and Kars soils are moderately droughty and are better suited to deep-rooted legumes than to shallow-rooted ones, although both types produce good yields.

The soils are well suited to pasture. Any good pasture mixture can be used for seeding.

Suitability for planting trees.—Most trees grow well on these soils. The soils are well suited to black locust and hybrid poplar and to other deciduous trees common in the forests. They are also well suited to any of the species commonly grown for Christmas trees. Although white pine, Scotch pine, spruce, and larch will grow where the soil reaction is more than pH 6.0, they are susceptible to root rot fungus, *Fomes annosus*, when they become older. Red pine is not suited to soils that have a pH of more than 6.0.

MANAGEMENT GROUP 2

Deep, sandy, well-drained, nearly level soils.

The soils of this management group are deep, sandy, well drained, and nearly level. They have a more limited moisture-holding capacity and are more limited in their ability to hold plant nutrients than the soils of group 1. Normally, these soils respond well to good management, and crops grown on them produce good yields. During dry seasons the soils are moderately droughty. They are all easy to work and conserve. Good management is needed to maintain the supply of organic matter and to prevent the soils from being eroded by wind.

TABLE 2.—*Soils of management group 2, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach— pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Colonie fine sandy loam, 0 to 3 percent slopes	Low.	Low.	5. 0	2. 0–2. 5	2. 5–3. 0	3. 0–3. 5
Groveton fine sandy loam, 0 to 3 percent slopes	Low.	Low.	5. 5	1. 0–1. 5	1. 5–2. 0	2. 0–2. 5
Petoskey fine sandy loam, 0 to 3 percent slopes	Low.	High.	6. 0	----------	1. 0–1. 5	1. 0–1. 5

Cropping systems [2]	Supporting practices
Rc–Rc–C–S–S	Windbreaks where blowing is evident.
R–C–S	Windbreaks where blowing is evident.
R–C–S–S	Windbreaks where blowing is evident.
C–S–S–S	None.
S–S–S–S	None.

[1] For definitions, see section, Some Steps to Good Management.

[2] Rc=row crop with a cover crop; C=close-growing crop; S=sod-forming crop; R=row or intertilled crop.

The soils in this group are listed in table 2 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group have a medium to low supply of nitrogen. They have a medium supply of phosphorus and are low in available potassium. Before applying fertilizer, the soils should be tested to determine the specific amounts of phosphate and potash needed.

Lime needs.—The Colonie and Groveton soils are strongly acid or very strongly acid. In some places the Petoskey soil is neutral throughout and has free lime within reach of plant roots. In others the surface layer is medium acid and the soil is neutral at depths of 3 feet or less. Tests are needed to determine the specific requirements of the soils for lime.

Suitability for crops and pastures.—The soils of this group are moderately well suited to most of the crops commonly grown in the county. Generally, drought-resistant crops or crops that make their growth in spring and early in summer before dry weather are the most productive. The soils are well suited to early vegetable crops, but potatoes grown on the Petoskey soil may be subject to potato scab. All of the soils are better suited to deep-rooted legumes than to shallow-rooted ones.

These soils are better suited to rotation pasture than to permanent pasture. Normally, grazing is good on these soils, but in dry years, even though grazing is good in spring and early in summer, it is lower than normal by midsummer. The deep-rooted pasture plants provide the best forage in dry seasons.

Suitability for planting trees.—Except where the surface layer of the soils is low in plant nutrients and the early growth has thus become retarded, black locust, hybrid poplar, and other hardwoods grow well on these soils. Generally, all of the conifers commonly planted in the county also grow well. Where the surface layer has a pH of 6.0 or more, however, conifers grow well but are susceptible to root rot when they become older. Red pine does not grow where the soil has a pH of 6.0 or more.

Class II

Soils that have moderate limitations if tilled; suitable for crops, pasture, and trees.

Subclass IIe.—Soils that have moderate risk of erosion if cover is not maintained.

MANAGEMENT GROUP 3

Deep to moderately deep, gently sloping soils.

The soils of this management group are deep to moderately deep and are well drained. They are moderate to high in available moisture-holding capacity and are high in their ability to hold plant nutrients. Runoff on these gently sloping soils is medium, and the hazard of erosion is moderate. If well managed, these are among the best agricultural soils in the county.

The soils in this group are listed in table 3 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group have a moderate supply of nitrogen and phosphorus. The Dover soil is low in its ability to supply potassium. The other soils are medium in their ability to supply potassium, but the Howard and Kars soils are slightly lower than all the rest, except the Dover, and the Mohawk is somewhat higher than the rest. Soil tests are needed to determine the specific amounts of potash required. The soils generally need about the same amount of fertilizer as is suggested for soils of average fertility.

Lime needs.—Except for Herkimer silt loam, acid, 3 to 8 percent slopes, and the Howard and Poland soils, the soils of this group are normally nearly neutral at the surface and have free lime within reach of plant roots. In places, however, the surface layer is medium acid to strongly acid. Herkimer silt loam, acid, 3 to 8 percent slopes, is strongly acid throughout, but the Howard and Poland soils have an acid surface layer and upper subsoil and free lime generally at depths of 3 to 3½ feet. Tests are needed to determine the specific requirements of the soils for lime.

TABLE 3.—*Soils of management group 3, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach— pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Dover stony loam, 3 to 8 percent slopes	Low.	High.	5.0	3.5–4.0	4.5–5.0	5.0–5.5
Herkimer silt loam, neutral, 3 to 8 percent slopes	Medium.	High.	5.5	2.0–2.5	2.5–3.0	3.0–3.5
Herkimer silt loam, acid, 3 to 8 percent slopes	Medium.	Low.	6.0	----------	1.0–1.5	1.5–2.0
Howard loam, 3 to 8 percent slopes	Medium.	Medium.				
Kars gravelly loam, 3 to 8 percent slopes	Medium.	High.				
Mohawk silt loam, 2 to 8 percent slopes	Medium.	High.				
Nellis loam, deep, 2 to 8 percent slopes	Medium.	High.				
Nellis loam, moderately deep, 2 to 8 percent slopes	Medium.	High.				
Poland silt loam, 3 to 8 percent slopes	Medium.	Medium.				

Cropping systems [2]	Supporting practices according to length of slope: *300 feet*	*400 feet*	*600 feet*
Rc–Rc–C–S	Cross-slope cultivation	Contour cultivation; diversion terraces.[3]	Contour cultivation; stripcropping; diversion terraces.[3]
R–R–C–S–S	Cross-slope cultivation	Same	Same.
R–C–S	Cross-slope cultivation	Same	Same.
R–C–S–S	Cross-slope cultivation	Stripcropping; contour cultivation.	Stripcropping; contour cultivation.
R–C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
S–S–S–S	Not needed	Not needed	Not needed.

[1] For definitions, see section, Some Steps to Good Management.

[2] Rc=row crop with a cover crop; C=close-growing crop; S=sod-forming crop; R=row or intertilled crop.

[3] Diversion terraces are not needed on the Howard and Kars soils, and they cannot be used on Nellis loam, moderately deep, 2 to 8 percent slopes, because bedrock occurs at depths between 24 and 40 inches.

Suitability for crops and pastures.—The soils of this group are suited to most of the crops normally grown in the county. Generally, they can be used for row crops. In this way, the more erodible, less productive soils on the farm can be used for sod crops. Among the row crops to which the soils are well suited are corn, potatoes, and the other vegetables commonly grown in the county. If the corn is to be harvested for grain, however, it is best to plant the earliest maturing varieties. Potatoes grown on the Dover, Herkimer, Kars, Mohawk, and Nellis soils of this group may be subject to potato scab. The close-growing crops to which the soils are suited are wheat, oats, and barley. Although these soils are well suited to alfalfa, any of the legume-grass mixtures commonly grown can be used.

All of the soils are well suited to any of the mixtures commonly used for seeding on well-drained pasture soils. Because of slightly lower available moisture-holding capacity, the Dover, Howard, and Kars soils are less well suited to shallow-rooted legumes than the other soils of the group.

Suitability for planting trees.—These soils are well suited to many kinds of trees. Their suitability for the various kinds, however, depends largely on the pH of the upper part of the profile. If the surface soil has a pH below 6.0, all of the species generally used in forest planting grow well, including black locust, hybrid poplar, and other hardwoods. If the surface soil is neutral or mildly alkaline, as in some areas of Kars soil, red pine should not be planted. Other conifers generally grow well but are susceptible to root rot when the trees become older. On the few areas where free lime occurs in the surface layer, it is best to limit planting to hardwoods, Austrian pine, European larch, and whitecedar. Where the soil is less than 30 inches deep above bedrock, hybrid poplar, balsam, Japanese larch, and spruce should not be planted.

MANAGEMENT GROUP 4

Deep, nearly level and gently sloping sandy loams and fine sandy loams.

Deep, sandy, well-drained, nearly level to gently sloping soils make up this management group. The soils have a moderate capacity to hold available moisture and plant nutrients. They are subject to drought in dry years. Even though permeability is rapid, runoff causes moderate erosion. The soils require practices to maintain the supply of organic matter and are responsive to good management.

The soils in this group are listed in table 4 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group have a medium to low supply of nitrogen. Their supply of phosphorus is medium, and they are low in available potassium. Before applying fertilizer, the soils need to be tested to determine the specific amounts of phosphate and potash required. They need good management to maintain the supply of plant nutrients, especially of nitrogen and potassium.

Lime needs.—The Colonie and Melrose soils are strongly acid or very strongly acid at depths within reach of plant roots. The Petoskey soil has a neutral to medium acid surface layer; the rest of its profile is neutral or calcareous. Tests are needed to determine the specific requirements of the soils for lime.

Suitability for crops and pastures.—The soils of this group are suited to most of the crops commonly grown in the county. They are droughty, however, and are best suited to deep-rooted crops or crops that grow well in spring or early in summer. Early vegetables, corn, and potatoes grow well, although potatoes grown on areas of the nearly neutral Petoskey soil may be subject to potato scab.

The soils are well suited to deep-rooted pasture plants. Normally, grazing is good on these soils, but, because of droughtiness, grazing is lower by midsummer than on most of the associated soils.

Suitability for planting trees.—Black locust, hybrid poplar, and other hardwoods grow well on the more fertile areas of the Colonie and Petoskey soils of this group. All of the conifers commonly planted in the county grow well on these soils. Red pine should not be planted, however, on areas of the Petoskey soil that have a neutral or alkaline surface layer; Austrian pine generally will grow well in such places.

MANAGEMENT GROUP 5

Deep, gently sloping, very strongly acid soils.

Deep, well-drained, gently sloping soils make up this management group. The soils are all moderate in their ability to hold available moisture and plant nutrients. They are very strongly acid, and generally their supply of plant nutrients is low. Runoff causes moderate erosion. Except for the Gloucester soils, these soils have a strongly expressed fragipan. They require lime and fertilizer as well as practices to control runoff. They are moderately responsive to good management.

The soils in the group are listed in table 5 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group are low in nitrogen. They have a medium to slightly lower supply of phosphorus. Except for the Pinckney soil and Worth flaggy silt loam, 3 to 8 percent slopes, which have a medium supply, the soils are low in available potassium. Before applying fertilizer, the soils should be tested to determine the specific amounts of phosphate and potash needed. When these acid soils are limed heavily, the phosphorus becomes more available to crops during the next growing season and the potassium becomes less available. Therefore, when the soils are limed heavily they also require heavier than normal applications of potash.

Lime needs.—The rooting zone of most of these soils is very strongly acid. Only Gloucester fine sandy loam, neutral substratum, 3 to 8 percent slopes, has a neutral pH at depths within reach of plant roots. It is best to have the soils tested to determine the specific requirements for lime. Generally, these soils require about as much lime in initial applications as soils that have a pH of 5.0.

Suitability for crops and pastures.—Although stoniness hinders tillage, the soils of this group are suited to most of the crops commonly grown in the county. Because they are naturally low in plant nutrients, they are not so well suited to alfalfa, potatoes, vegetables, and other crops that require a soil high in plant nutrients. Yields are moderate, however, if the soils are adequately limed and fertilized.

The soils of this group are all potentially good soils for pasture. They require lime and a complete fertilizer. Generally, it is difficult to renovate native pastures or to maintain permanent pastures on them. They are best used for rotation pastures. Pasture plants suited to the amounts of lime and fertilizer to be used should be planted.

TABLE 4.—*Soils of management group 4, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Colonie fine sandy loam, 3 to 8 percent slopes	Low.	Low.	5. 0	2. 0–2. 5	2. 5–3. 0	3. 0–3. 5
Melrose sandy loam, 0 to 6 percent slopes	Low.	Low.	5. 5	1. 0–1. 5	1. 5–2. 0	2. 0–2. 5
Petoskey fine sandy loam, 3 to 8 percent slopes	Low.	High.	6. 0		1. 0–1. 5	1. 0–1. 5

Cropping systems [2]	Supporting practices according to length of slope [3]		
	300 feet	*400 feet*	*600 feet*
Rc–Rc–C–S–S	Cross-slope cultivation	Contour cultivation	Contour stripcropping.
R–C–S–S	Cross-slope cultivation	Contour cultivation	Contour cultivation.
R–C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
S–S–S–S	Not needed	Not needed	Not needed.

[1] For definitions, see section, Some Steps to Good Management.
[2] Rc=row crop with a cover crop; C=close-growing crop; S=sod-forming crop; R=row or intertilled crops.
[3] Use windbreaks wherever there is evidence of soil blowing.

TABLE 5.—*Soils of management group 5, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach— pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Essex stony fine sandy loam, 3 to 8 percent slopes	Low.	Low.	5.0	2.5–3.0	3.5–4.0	4.0–4.5
Gloucester stony fine sandy loam, 3 to 8 percent slopes	Low.	Low.	5.5	1.5–2.0	2.0–2.5	2.5–3.0
Gloucester stony sandy loam, 3 to 8 percent slopes	Low.	Low.	6.0	----------	1.0–1.5	1.5–2.0
Gloucester fine sandy loam, neutral substratum, 3 to 8 percent slopes.	Low.	Low.				
Pinckney silt loam, 3 to 8 percent slopes	Medium.	Low.				
Worth stony loam, 3 to 8 percent slopes	Low.	Low.				
Worth flaggy silt loam, 3 to 8 percent slopes	Medium.	Low.				

Cropping systems [2]	Supporting practices according to length of slope: *300 feet*	*400 feet*	*600 feet*
R–C–S–S	Cross-slope cultivation	Contour cultivation	Contour cultivation.[3]
R–C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
S–S–S–S	Not needed	Not needed	Not needed.

[1] For definitions, see section, Some Steps to Good Management.
[2] R=row or intertilled crop; C=close-growing crop; S=sod-forming crop.
[3] The Pinckney soil needs contour stripcropping on slopes longer than 600 feet if row crops are grown more frequently than 1 year in 4.

Suitability for planting trees.—Of this group of soils, black locust and hybrid poplar grow well only on Gloucester fine sandy loam, neutral substratum, 3 to 8 percent slopes. The soils are well suited to red, white, and Scotch pine, European and Japanese larch, and Norway and white spruce. In addition, balsam fir, Austrian pine, and Douglas-fir can be grown large enough to cut for Christmas trees.

MANAGEMENT GROUP 6

Deep, nearly level and gently sloping, moderately slowly permeable soils.

The soils in this group are deep and well drained. They are high in ability to hold available moisture and plant nutrients. These soils occupy nearly level to gently sloping areas, but because they have a silty or loamy texture and moderately slow permeability, they are highly erodible. The soils are responsive to good management. When they are well managed, they are among the better agricultural soils of the county, but they deteriorate rapidly under poor management.

The soils in the group are listed in table 6 along with facts about their ability to supply lime and potassium. Also listed, are suitable cropping systems and supporting practices.

Fertility.—The soils in this group all have a moderate supply of nitrogen and phosphorus. The plow layer of all the soils is medium in available potassium. The subsoil of the Hartland soil has less available potassium, however, than that of the other soils. Before fertilizer is applied, tests are needed to determine the specific requirements of the soils for potash.

Lime needs.—Although the Hudson soil has a slightly acid to strongly acid plow layer, free lime occurs in the subsoil at depths within reach of plant roots. In contrast, the Hartland and Suffield soils are very strongly acid throughout the rooting zone unless they have been limed. All the soils require lime and should be tested to determine their specific needs.

Suitability for crops and pastures.—The soils of this group are suited to most of the crops commonly grown in the county. Corn, vegetables, potatoes, wheat, oats, and barley grow well, and the soils are suited to both deep- and shallow-rooted legumes. If row crops are grown, the soils will need more careful management than most soils on similar slopes. Under good management, however, crops will produce good yields. Of all the soils in the group, the Hartland soil is the best suited to intensive growing of row crops and the Suffield soils are the least suited.

The soils of this group are well suited to all of the desirable mixtures used to seed pastures in this area. On these soils, better forage is generally produced in rotation pastures than in permanent pastures, but high yields can be maintained for either kind if the soils are adequately limed and fertilized.

Suitability for planting trees.—Hardwood trees, including black locust, can be grown wherever the surface layer of these soils has a sufficient supply of plant nutrients. The soils are well suited to most conifers. It is best not to plant hybrid poplar or red pine where the subsoil is slowly permeable or in the less well drained areas.

MANAGEMENT GROUP 7

Moderately well drained to somewhat poorly drained, gently sloping soils.

The soils in this group are deep to moderately deep, medium textured, and moderately well drained to somewhat poorly drained. The soils are gently sloping and are high in ability to supply available moisture. Some of them receive excess water from adjacent soils, or they have a subsoil that is moderately slow to slow in perme-

ability. Runoff is medium, and the hazard of erosion is moderate. The soils require special practices to control erosion if they are used intensively for crops.

The soils in the group are listed in table 7 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group have a moderate supply of nitrogen, but it is not so readily available in spring as that in the better drained soils. All of the soils have a medium supply of phosphorus. The Amenia and Turin soils are medium and the Houseville and Manheim soils are high in available potassium. Before applying fertilizer, tests are needed to determine the specific amounts of phosphate and potash needed.

Lime needs.—Except for the Turin soil, all of the soils in this group have a neutral to medium acid plow layer and free lime in the substratum. The Turin soil has an acid plow layer, but it has lime in the substratum. Tests are needed to determine the requirements of the soils for lime.

Suitability for crops and pastures.—Peas and other early crops or crops that are especially sensitive to wetness are damaged in some years. Nevertheless, the soils in this group are well suited to all the crops commonly grown in the county. The soils are not so wet that water-sensitive crops are seriously affected, but late vegetables grow better than early ones. Small grains and alfalfa grow well. Ladino clover and other shallow-rooted legumes make better yields on these soils in normal seasons than on the associated well-drained soils.

These soils are well suited to pasture. The pastures produce abundant forage in spring and early in summer and maintain better yields during the dryer months than the better drained soils. Yields of shallow-rooted legumes are very good, but the soils are equally well suited to the more water-tolerant, deep-rooted legumes. Although rotation pastures generally produce the most forage, good yields can be obtained on permanent pastures.

Suitability for planting trees.—Hardwood trees common to the area, other than locust and poplar, can be grown on the moderately well drained soils of this group. Generally, all of the soils are suited to white and Scotch pine, Norway and white spruce, Japanese and European larch, whitecedar, and balsam fir for Christmas trees. The least well drained soils are best used for spruce. Where the surface layer has a pH of more than 6.0, conifers are subject to root rot. In shallow areas associated with the Amenia soils and in other places where free lime occurs in the surface layer, it is best to plant whitecedar or to grow Austrian pine and white spruce for Christmas trees.

MANAGEMENT GROUP 8

Moderately well drained to somewhat poorly drained, level to gently sloping soils.

This management group consists of sandy, deep, level to gently sloping soils. The soils are moderately well drained to somewhat poorly drained and range from moderate to high in available moisture-holding capacity. They have a moderately low ability to hold plant nutrients. In the Elmwood soil internal drainage is retarded by clay that underlies the soil. In the Galen soil it is retarded by lenses of silt that occur in the substratum. Generally, the water table is high. Wind erosion creates a moderate hazard, and on soils that have slopes of more than 2 percent there is a moderate erosion hazard from runoff. Because of the restricted drainage, the soils are best used for annual crops, for shallow-rooted perennials, or for water-tolerant, deep-rooted perennials.

TABLE 6.—*Soils of management group 6, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—[2] pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Hartland very fine sandy loam, 2 to 6 percent slopes	Low.	Low.	5.0	3.5–4.0	4.5–5.0	5.0–5.5
Hudson silt loam, 0 to 6 percent slopes	Medium.	Medium.	5.5	2.0–2.5	2.5–3.0	3.0–3.5
Suffield silt loam, 0 to 2 percent slopes	Medium.	Low.	6.0	----------	1.0–1.5	1.5–2.0
Suffield silt loam, 2 to 6 percent slopes	Medium.	Low.				

Cropping systems [3]	Supporting practices according to length of slope [4]: *300 feet*	*400 feet*	*600 feet*
R–R–C–S–S	Cross-slope cultivation	Contour cultivation; diversion terraces.	Contour stripcropping; diversion terraces.
R–C–S	Cross-slope cultivation	Same	Same.
R–C–S–S	Cross-slope cultivation	Contour cultivation	Contour cultivation.
R–C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Contour cultivation.
C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
S–S–S–S	Not needed	Not needed	Not needed.

[1] For definitions, see section, Some Steps to Good Management.
[2] For Hartland soil, decrease amounts of lime suggested for the soils of the group by about 25 percent.
[3] R=row or intertilled crop; C=close-growing crop; S=sod-forming crop.
[4] The Hartland soil also needs windbreaks if row crops are grown for 2 years in succession and there is evidence of soil blowing; Suffield silt loam, 0 to 2 percent slopes, needs only cross-slope cultivation for all cropping systems listed.

TABLE 7.—*Soils of management group 7, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach— pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Amenia loam, deep, 3 to 8 percent slopes	Medium.	High.	5.0	3.5–4.0	4.5–5.0	5.0–5.5
Amenia loam, moderately deep, 3 to 8 percent slopes	Medium.	High.	5.5	2.0–2.5	2.5–3.0	3.0–3.5
Houseville silt loam, neutral, 3 to 8 percent slopes	High.	High.	6.0		1.0–1.5	1.5–2.0
Houseville silt loam, acid, 3 to 10 percent slopes	High.	Low.				
Manheim silt loam, 3 to 8 percent slopes	High.	High.				
Turin silt loam, 3 to 8 percent slopes	Medium.	Medium.				

Cropping systems [2]	Supporting practices according to length of slope [3]: 200 feet	400 feet	600 feet
Rc–Rc–C–S	Cross-slope cultivation	Grade strips; drainage diversions.	Grade strips; drainage diversions.
R–R–C–S–S	Cross-slope cultivation	Same	Same.
R–C–S	Cross-slope cultivation	Same	Same.
R–C–S–S	Cross-slope cultivation	Same	Same.
R–C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
S–S–S–S	Not needed	Not needed	Not needed.

[1] For definitions, see section, Some Steps to Good Management.
[2] Rc=row crop with a cover crop; C=close-growing crop; S=sod-forming crop; R=row or intertilled crop.
[3] On 200-foot slopes somewhat poorly drained soils on nearly straight or slightly concave slopes need drainage diversions; on 400-foot slopes moderately well drained soils on slightly convex slopes need diversion terraces or contour cultivation instead of grade strips; and on 600-foot slopes they need contour strips; Amenia loam, moderately deep, 3 to 8 percent slopes, is not suited to diversion terraces because of shallowness to bedrock.

TABLE 8.—*Soils of management group 8, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach— pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Elmwood sandy loam, 0 to 6 percent slopes	Low.	Low.	5.0	2.0–2.5	2.5–3.0	3.0–3.5
Galen fine sandy loam, 0 to 6 percent slopes	Low.	High.	5.5	1.0–1.5	1.5–2.0	2.0–2.5
			6.0		1.0–1.5	1.0–1.5

Cropping systems [2]	Supporting practices according to length of slope: 200 feet	400 feet	600 feet
Rc–Rc–C–S	Cross-slope cultivation	Contour cultivation; diversion terraces.	Contour strips; diversion terraces.
R–R–C–S–S	Cross-slope cultivation	Same	Same.
R–C–S	Cross-slope cultivation	Same	Same.
R–C–S–S	Cross-slope cultivation	Contour cultivation	Contour strips.
R–C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Contour cultivation.
C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
S–S–S–S	Not needed	Not needed	Not needed.

[1] For definitions, see section, Some Steps to Good Management.
[2] Rc=row crop with a cover crop; C=close-growing crop; S=sod-forming crop; R=row or intertilled crop.

The soils of this group respond well to good management. They are listed in table 8 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group have a moderate to low supply of nitrogen. They have a moderate supply of phosphorus and are low in available potassium. The supply of nitrogen and phosphorus does not last long after the soils are fertilized, and it decreases rapidly if the soils are poorly managed. When the soils are heavily limed, they may be deficient in potassium during the next growing season. Before applying fertilizer, tests are needed to determine the specific amounts of phosphate and potash that will be required.

Lime needs.—The rooting zone of the soils in this group is strongly acid to slightly acid. Tests are needed to determine the requirements of the soils for lime.

Suitability for crops and pastures.—If the supply of plant nutrients is maintained, the soils of this group are well suited to most crops, even though drainage is poor enough to slightly delay planting in spring. The soils are less droughty than the associated sandy, better drained soils. Except for peas and other early vegetables that do not tolerate excessive moisture, most vegetables grow well. Corn, potatoes, small grains, and most forage crops make good yields. The soils are suited to both deep- and shallow-rooted legumes.

Spring and early summer grazing is good on these soils, and the soils can be grazed longer than the associated well-drained soils. By midsummer, however, pastures generally are subject to drought. Because the soils have a low supply of plant nutrients, it is best to use plants that tolerate drought on these soils. Nevertheless, most legumes and grasses suited to well-drained soils can be grown. Generally, rotation pastures give better yields on these soils than permanent pastures. Most native pastures are poor.

Suitability for planting trees.—Hardwoods common to the area, other than black locust and poplar, can be grown on both the Galen and Elmwood soils. Both of the soils in this group, however, are also suited to white and Scotch pine, white and Norway spruce, and European and Japanese larch. Balsam fir can be grown for Christmas trees.

MANAGEMENT GROUP 9

Nearly level to gently sloping soils that have slowly permeable subsoils.

The soils in this management group are somewhat poorly drained to moderately well drained and are nearly level to gently sloping. They have a silty or loamy surface layer and a clayey, slowly permeable subsoil. The soils range from moderate to high in available water-holding capacity and in ability to hold plant nutrients. They have a moderate hazard of erosion. If intensively used, the soils require special practices to improve drainage, to control erosion, and to maintain the supply of organic matter.

All of these soils respond well to good management. The soils in the group are listed in table 9 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group have a medium supply of nitrogen and phosphorus. The supply of available potassium is high in the silt loams and medium in the very fine sandy loams. Before applying fertilizer, tests are needed to determine the specific amounts of phosphate and potash the soils require.

Lime needs.—The rooting zone of the Buxton soils in this group is strongly acid to very strongly acid. The Rhinebeck soil has a slightly acid plow layer and free lime in the substratum. Tests are needed to determine the requirements of the soils for lime.

TABLE 9.—*Soils of management group 9, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach— pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Buxton silt loam, 2 to 6 percent slopes	High.	Low.	5.0	4.0–4.5	5.0–5.5	5.5–6.0
Buxton very fine sandy loam, 0 to 6 percent slopes	Medium.	Low.	5.5	2.5–3.0	3.0–3.5	3.5–4.0
Rhinebeck silt loam, 1 to 6 percent slopes	High.	Medium.	6.0		1.0–1.5	1.5–2.0

Cropping systems [2]	Supporting practices according to length of slope [3] — *300 feet*	*400 feet*	*600 feet*
R–C–S–S	Cross-slope cultivation	Drainage diversions	Drainage diversions; grade strips.
R–C–S–S–S	Cross-slope cultivation	Drainage diversions	Same.
C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
S–S–S–S	Not needed	Not needed	Not needed.

[1] For definitions, see section, Some Steps to Good Management.
[2] R=row or intertilled crop; C=close-growing crop; S=sod-forming crop.
[3] Where slopes are less than 3 percent, the drainage diversions and graded strips should be replaced by open ditch or tile drainage on Buxton very fine sandy loam, 0 to 6 percent slopes, and by open ditch drainage on the silt loams.

Suitability for crops and pastures.—These soils are somewhat wet; therefore, they are only moderately well suited to crops. They are best suited to corn, small grains, and shallow-rooted or water-tolerant legumes. Birdsfoot trefoil and the water-tolerant varieties of alfalfa can be grown. Generally, early vegetables or potatoes and other crops that require high inputs of labor and plant nutrients do not respond well enough to management to justify growing them.

Although these soils are especially well suited to ladino clover and other shallow-rooted legumes grown for pasture, they are also well suited to birdsfoot trefoil. Generally, rotation pastures are best on these soils. Native pastures, however, can be renovated more successfully than on most of the other soils in the county. Pastures on all of the soils require lime and fertilizer.

Suitability for planting trees.—The soils of this group are suited to hardwoods, other than black locust and poplar, that are common to the area. Generally, white and Scotch pine, white and Norway spruce, and European and Japanese larch will grow well, but it is best not to plant Scotch pine and larches on the associated wet soils. Balsam fir can be grown for use as Christmas trees.

MANAGEMENT GROUP 10

Gently sloping soils that have fragipans below 16 to 21 inches.

This management group consists of gently sloping soils that have fragipans at depths below 16 to 21 inches. The soils are medium textured and are moderately well drained to somewhat poorly drained. The Camroden soil is finer textured and somewhat more erodible than the other soils of the group. These soils are very strongly acid and are low in plant nutrients. Permeability is slow. Runoff is rapid and causes moderate erosion. Because the soils are periodically wet, they are best suited to water-tolerant, deep-rooted perennials.

The soils in this group are listed in table 10 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group have a low supply of nitrogen and a moderate supply of phosphorus. They generally range from medium to low in ability to supply potassium, but at times the tests show a range of medium to high. The soils are slow in their ability to replenish potassium, however, after crops use the supply available. Normally, after the soils have been limed, potassium becomes less available to crops during the next growing season and phosphorus becomes more available. Before applying fertilizer, the soils need to be tested to determine the specific amounts of phosphate and potash they require.

Lime needs.—The rooting zone of all of the soils in this group is very strongly acid. To correct the initial acidity, the soils generally require the amounts of lime suggested in table 10 for soils that have a pH value of 5.0. Nevertheless, before further lime is applied, soil tests are needed to determine the specific amounts required.

Suitability for crops and pastures.—The low supply of plant nutrients and restricted drainage limit the use of the soils of this group for crops. Lime and a complete fertilizer are required for all crops. The response of the soils to lime and fertilizer is uncertain, however, because of the periodic wetness of the soils in summer. Consequently, crops should be chosen that are not costly to grow. The soils are suited to crops ordinarily grown on dairy farms. Although potatoes can be grown successfully, corn for silage, oats, and hay crops are used the most commonly in the rotation, or the soils are pastured. The soils are well suited to both deep- and shallow-rooted legumes, but birdsfoot trefoil, some varieties of alfalfa, and various kinds of clover grow the best.

All of these soils are well suited to pasture. Nevertheless, they require adequate lime and fertilizer for good yields. It is hard to maintain good permanent pastures

TABLE 10.—*Soils of management group 10, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—[2] pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Camroden silt loam, 3 to 8 percent slopes	Medium.	Low.	5. 0	3. 5–4. 0	4. 5–5. 0	5. 0–5. 5
Empeyville flaggy silt loam, 3 to 8 percent slopes	Medium.	Low.	5. 5	2. 0–2. 5	2. 5–3. 0	3. 0–3. 5
Empeyville stony loam, 3 to 8 percent slopes	Low.	Low.	6. 0	----------	1. 0–1. 5	1. 5–2. 0
Scituate stony fine sandy loam, 3 to 8 percent slopes	Low.	Low.				

Cropping systems [3]	Supporting practices according to length of slope [4]: *300 feet*	*400 feet*	*600 feet*
R–C–S–S	Cross-slope cultivation	Contour cultivation	Contour cultivation.
R–C–S–S–S	Cross-slope cultivation	Contour cultivation	Contour cultivation.
R–C–S–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
S–S–S–S	Not needed	Not needed	Not needed.

[1] For definitions, see section, Some Steps to Good Management.
[2] For Scituate soil, decrease amount of lime by about 20 percent.
[3] R=row or intertilled crop; C=close-growing crop; S=sod-forming crop.
[4] On the somewhat poorly drained areas of the Camroden and Scituate soils, instead of contour cultivation, drainage diversions should be used with graded strips.

TABLE 11.—*Soils of management group 11, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—[2]		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Chagrin silt loam, 0 to 2 percent slopes	Medium.	Medium.	5. 0	3. 5–4. 0	4. 5–5. 0	5. 0–5. 5
Genesee silt loam, 0 to 2 percent slopes	Medium.	High.	5. 5	2. 0–2. 5	2. 5–3. 0	3. 0–3. 5
Genesee silt loam, alluvial fans, 0 to 3 percent slopes	Medium.	High.	6. 0	----------	1. 0–1. 5	1. 5–2. 0
Ondawa loam, 0 to 2 percent slopes	Low.	Low.				
Ondawa loamy sand, 2 to 5 percent slopes	Low.	Low.				

Cropping systems [3]	Supporting practices
Rc–Rc–Rc; Rc–Rc–C–S; R–R–C–S–S; R–C–S; R–C–S–S; R–C–S–S–S; C–S–S–S; S–S–S–S.	Protection of streambanks and control of the stream channel required for all rotations.

[1] For definitions, see section, Some Steps to Good Management.

[2] For Ondawa loamy sand, 2 to 5 percent slopes, use about 40 percent less if amount suggested is greater than 1 ton.

[2] Rc=row crop with a cover crop; C=close-growing crop; S=sod-forming crop; R=row or intertilled crop.

or to renovate native pastures, and rotation pastures are best. Any good pasture mixture used for similar soils can be used for seeding on these soils.

Suitability for planting trees.—Hardwoods seldom grow well on these soils. Black locust grows well enough to allow other hardwoods to get a start or to provide a cover for wildlife; it does not grow well enough to use for commercial purposes. Generally, the soils are suited to white and Scotch pine, white and Norway spruce, European and Japanese larch, and balsam fir. Except for use as Christmas trees, it is best not to plant larches or Scotch pine on the wetter soils.

Subclass IIw.—Soils that have moderate limitations because of excess water.

MANAGEMENT GROUP 11

Well-drained soils on flood plains.

This group consists of well-drained soils on flood plains. The soils are subject to occasional flooding. This hazard seriously limits the use of some areas, but most areas are flooded only in early spring. Except for Ondawa loamy sand, 2 to 5 percent slopes, which is slightly droughty, the soils are high in their ability to hold moisture. They respond well to good management and are among the best soils for agriculture in the county.

The soils in the group are listed in table 11 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group have a moderate supply of nitrogen and phosphorus. The Ondawa soils are low in available potassium, but most of the soils have a moderate supply. When lime has been added, the potassium in the soils becomes less available. Tests are needed to determine the specific kinds and amounts of fertilizer needed.

Lime needs.—The Chagrin soil has an acid surface layer and a neutral substratum, the Genesee soils are neutral to mildly alkaline, and the Ondawa soils are acid throughout. Tests are needed to determine the amounts of lime needed.

Suitability for crops and pastures.—The soils in this group are well suited to most of the crops commonly grown in the county. All of the commonly grown vegetable crops do well, although potatoes grown on the Genesee soils are subject to potato scab. Corn and hay crops yield well, and pastures are good on these soils. Both deep- and shallow-rooted legumes also grow well. Small grains are more subject to lodging on these soils than on most of the soils in the county. Ondawa loamy sand, 2 to 5 percent slopes, is somewhat droughty; therefore, it is best to plant deep-rooted legumes on this soil.

Unless the hazard of flooding is serious, these soils are too valuable for crops to be used for permanent pasture. If they are used for pasture, any good pasture mixture suitable for well-drained soils can be used for seeding. On Ondawa loamy sand, 2 to 5 percent slopes, however, it is best to plant birdsfoot trefoil for long-term pasture rather than other legumes.

Suitability for planting trees.—Areas of the Chagrin and Genesee soils where flooding is of short duration are suited to hybrid poplar, white and Scotch pine, white and Norway spruce, European and Japanese larch, and whitecedar. In areas where the surface layer of the soils is neutral or alkaline, however, trees become susceptible to root rot as they become older. On the Ondawa soils or on other areas where flooding is frequent, the soils are best suited to hybrid poplar and whitecedar.

MANAGEMENT GROUP 12

Moderately well drained to somewhat poorly drained soils on flood plains.

The soils of this group are nearly level and are moderately well drained to somewhat poorly drained. They occur on flood plains. Because of wetness and flooding, the soils are moderately limited in their suitability for crops. They are subject to overflow in spring and are flooded occasionally in midsummer. Although the hazard of flooding varies from farm to farm, it is high in some places. Crops are sometimes damaged during wet periods. Normally, the water table is high in spring, but it is low

enough during the growing season to permit good rooting of plants.

Most of these soils respond well to good management. The soils in the group are listed in table 12 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—Except for the Podunk soils, which are low in potassium, the soils have a medium supply of nitrogen, phosphorus, and potassium. When they are limed, their ability to supply potassium generally decreases. Before fertilizer is applied, the soils need to be tested to determine the amounts of phosphate and potash required.

Lime needs.—The Eel soil is nearly neutral throughout; the Lobdell soils have an acid surface soil and subsoil, but their substratum is neutral at depths within reach of plant roots; and the Podunk soil is strongly acid to medium acid throughout. Tests are needed to determine the requirements of the soils for lime.

Suitability for crops and pastures.—Except for early spring crops or crops that are damaged by wetness that lasts for short periods, the soils in this group are well suited to most crops. Corn, hay crops, and vegetable crops that are planted late in spring will grow well. The soils are especially well suited to ladino clover and to other shallow-rooted legumes, as well as to other perennial and biennial, water-tolerant, shallow- or deep-rooted legumes. They are not so well suited to small grains. The hazard of flooding varies from farm to farm.

The soils are well suited to pasture plants. When they are properly limed and fertilized, they are among the best soils for permanent pasture of any in the county. Nevertheless, they are too productive of crops to be used for permanent pasture unless they are subject to severe flooding. They are better used for rotation pasture than permanent pasture.

Suitability for planting trees.—The Podunk soils are subject to prolonged flooding, and the only kind of tree to which they are suited is hybrid poplar. The soils in this group that have an acid to neutral surface layer and that are somewhat better drained than the others are suited to white and Scotch pine, white and Norway spruce, and Japanese larch. The wetter areas of such soils can be used for spruce, white pine, and whitecedar. The more alkaline soils can be used for whitecedar or for spruce, balsam, and Austrian pine grown as Christmas trees. Pine, larch, and spruce, grown on soils that have a neutral to alkaline surface soil, are susceptible to root rot when they become older.

MANAGEMENT GROUP 13

Moderately well drained to somewhat poorly drained soils on glacial till or lake-laid materials.

The soils of this management group are nearly level and are deep to moderately deep. They are moderately well drained to somewhat poorly drained. Except for the Buxton soil, which has formed on lake-laid materials, the soils have formed on glacial till. Internal drainage in all the soils is restricted, but only the Camroden soil has a distinct pan. All of the soils are high in ability to supply water. The soils in moderately well drained areas or where drainage is improved will respond well to management.

The soils in this group are listed in table 13 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group have a moderate supply of nitrogen, but it is not so readily available in spring as that in the better drained soils. The supply of available phosphorus is also moderate. In the Amenia, Camroden, and Turin soils, the ability to supply potassium is medium, but in the Buxton, Houseville, and Manheim soils it is high. Before applying fertilizer, test the soils to determine the specific needs for potash and phosphate.

Lime needs.—The Amenia soils, the neutral phase of the Houseville soils, and the Manheim soil have a plow layer that is slightly acid to medium acid, and free lime occurs within the rooting zone. These soils require little lime. Turin silt loam, 0 to 3 percent slopes, has a strongly acid surface layer, but free lime occurs in the substratum.

TABLE 12.—*Soils of management group 12, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—[2]		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Eel silt loam, 0 to 2 percent slopes	Medium.	High.	5.0	3.5–5.0	4.5–5.0	5.0–5.5
Lobdell silt loam, 0 to 2 percent slopes	Medium.	Medium.	5.5	2.0–2.5	2.5–3.0	3.0–3.5
Lobdell shaly silt loam, 0 to 3 percent slopes	Medium.	Medium.	6.0	----------	1.0–1.5	1.5–2.0
Podunk loam and fine sandy loam, 0 to 2 percent slopes	Low.	Low.				

Cropping systems [3]	Supporting practices
Rc-Rc-Rc; Rc-Rc-C-S; R-R-C-S-S; R-C-S; R-C-S-S; R-C-S-S-S; C-S-S-S; S-S-S-S.	Protection of streambanks, deepening of stream channels, and spot drainage required for all the soils.

[1] For definitions, see section, Some Steps to Good Management.
[2] For Podunk soil, decrease amounts of lime suggested by about 20 percent.
[3] Rc=row crop with a cover crop; C=close-growing crop; S=sod-forming crop; R=row or intertilled crop.

TABLE 13.—*Soils of management group 13, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—[2] pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Amenia loam, deep, 0 to 3 percent slopes	Medium.	High.	5. 0	3. 5–4. 0	4. 5–5. 0	5. 0–5. 5
Amenia loam, moderately deep, 0 to 3 percent slopes	Medium.	High.	5. 5	2. 0–2. 5	2. 5–3. 0	3. 0–3. 5
Buxton silt loam, 0 to 2 percent slopes	High.	Low.	6. 0	----------	1. 0–1. 5	1. 5–2. 0
Camroden silt loam, 0 to 3 percent slopes	Medium.	Low.				
Houseville silt loam, neutral, 0 to 3 percent slopes	High.	High.				
Houseville silt loam, acid, 0 to 3 percent slopes	High.	Low.				
Manheim silt loam, 0 to 3 percent slopes	High.	High.				
Turin silt loam, 0 to 3 percent slopes	Medium.	Medium.				

Cropping systems [3]	Supporting practices for soils that are— *Moderately well drained* [4]	*Somewhat poorly drained* [5]
Rc–Rc–Rc	Cross-slope cultivation	Open ditch or tile drainage.
Rc–Rc–C–S	Cross-slope cultivation	Open ditch or tile drainage.
R–R–C–S	Cross-slope cultivation	Open ditch or tile drainage.
R–C–S	Not needed	Open ditch or tile drainage.
R–C–S–S	Not needed	Open ditch or tile drainage.
R–C–S–S–S	Not needed	Open ditch or tile drainage.
C–S–S–S	Not needed	Open ditch or tile drainage.
S–S–S–S	Not needed	Not needed.

[1] For definitions, see section, Some Steps to Good Management.

[2] For Buxton and Houseville soils, increase amounts by about ½ ton.

[3] Rc=row crop with a cover crop; C=close-growing crop; S=sod-forming crop; R=row or intertilled crop.

[4] Normally, slopes are slightly convex and receive little seepage or runoff; the Amenia soils are dominantly moderately well drained and generally require less drainage; Amenia loam, moderately deep, 0 to 3 percent slopes, has bedrock at depths of 24 to 40 inches, and drainage is impractical.

[5] Areas generally have slopes that are straight and gentle or receive runoff from adjacent areas.

The Buxton, Camroden, and acid phase of the Houseville soils are acid at depths within reach of plant roots. All of the soils, however, need to be tested to determine the specific requirements of the soils for lime.

Suitability for crops and pastures.—These soils are suited to most of the crops commonly grown in the county. In some years crops that are planted early or that are sensitive to periodic wetness are damaged. The soils are better suited to late vegetables than to early ones. Peas are among the crops to which they are least suited. Normally, small grains make good yields, although in some years it may be necessary to plant oats too late for best yields. Of the legumes, the soils are well suited to water-tolerant varieties of alfalfa, birdsfoot trefoil, and various kinds of clover. The Amenia soils are the best drained of the soils within the group and are the best suited to crops.

The soils of this group are among the best in the county for pasture. Because of their moderate wetness, grazing remains good beyond the spring season. The soils are particularly well suited to clover if they are properly limed and fertilized. Nevertheless, on most farms these soils are among the best for crops. Therefore, even though permanent pastures produce well under good management, the soils are best used for rotation pasture.

Suitability for planting trees.—Where the surface layer has a pH that is less than 6.0, the soils are generally suited to white and Scotch pine, European and Japanese larch, and white and Norway spruce. Spruce grows better than larch, however, on the least well drained soils. Balsam can be grown for Christmas trees. All of these trees will also grow well on neutral soils, but on the neutral soils they are more susceptible to root rot when they become older. Although these neutral soils are not suited to locust and poplar, other hardwoods can be grown. Soils that have a neutral to alkaline surface layer and that are somewhat poorly drained are best used for growing whitecedar. In areas of this kind, white spruce, balsam, and pine generally can be grown for Christmas trees.

Class III

Soils that have severe limitations and require careful management if tilled; suitable for crops, pasture plants, and trees.

Subclass IIIe.—Soils that have severe risk of erosion.

MANAGEMENT GROUP 14

Well-drained, sloping soils.

The soils of this management group are sloping and are well drained. They range from moderate to high in available moisture-supplying capacity and in ability to supply plant nutrients. Except for the Herkimer, Howard, and Kars soils, which are on alluvial fans or on glacial outwash, the soils have formed in glacial till. In all the soils but Nellis loam, moderately deep, 8 to 15 percent slopes, bedrock is at depths of 40 inches or more. Runoff is rapid, and the hazard of erosion is high.

The soils in the group are listed in table 14 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group have a moderate supply of nitrogen and phosphorus. The Dover soil is low in ability to supply potassium. The other soils are medium in ability to supply potassium, but the Mohawk soil probably is highest, and the Kars and Howard are slightly lower than medium. The soils need testing to determine the specific amounts of phosphate and potash needed. Except for the Dover soil, however, the soils generally need about the same amount of fertilizer as is suggested for soils of average fertility.

Lime needs.—The Howard and Poland soils have a plow layer that is medium acid to strongly acid, but they have free lime at depths within reach of deep-rooted plants. The acid phase of the Herkimer soil is strongly acid to very strongly acid throughout the rooting zone. The other soils in the group have a plow layer that is neutral to medium acid, and free lime occurs within reach of plant roots. All of the soils need to be tested to determine the specific amounts of lime required.

Suitability for crops and pastures.—Although most of the crops commonly grown in the county can be grown, the slopes restrict the use of these soils for tilled crops. Both early and late vegetable crops can be grown, however, as well as potatoes, corn, small grains, and deep- and shallow-rooted legumes. Of the legumes, alfalfa is best suited to these soils. Potatoes grown on the Dover soil, the neutral phase of the Herkimer soil, and the Kars, Mohawk, and Nellis soils may be subject to potato scab.

Under good management both permanent and rotation pastures produce good yields on these soils. Because of lower available moisture-supplying capacity, however, the Dover, Howard, and Kars soils are slightly less well suited to shallow-rooted legumes than the other soils of the group.

Suitability for planting trees.—The soils of this group are well suited to most of the trees generally planted in the forests of the county. Hardwoods, including black locust and hybrid poplar, grow well if the depth to bedrock is 30 inches or more. Areas in which the pH of the surface layer is less than 6.0 are best suited to pine, spruce, and larch. If the pH is more than 6.0, it is best not to plant red pine or other conifers because of risk of damage from root rot when the trees become older. The soils are also not suited to spruce, Japanese larch, and balsam, because they are too shallow. If free lime occurs in the surface layer, as it does in places in the Kars soil, it is best to plant Austrian pine, European larch, and whitecedar.

MANAGEMENT GROUP 15

Well-drained to excessively drained, sloping or rolling soils.

The soils of this management group are deep and sandy and are well drained to excessively drained. They are sloping to rolling. The soils are moderately droughty and have a low to moderate supply of plant nutrients. Runoff is rapid and causes moderate erosion. In places the soils are also subject to wind erosion, and complex special practices are needed if they are cropped intensively. Management is needed to maintain the supply of organic matter in the soils.

TABLE 14.—*Soils of management group 14, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach— pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Dover stony loam, 8 to 15 percent slopes	Low.	High.	5.0	3.5–4.0	4.5–5.0	5.0–5.5
Herkimer silt loam, neutral, 8 to 15 percent slopes	Medium.	High.	5.5	2.0–2.5	2.5–3.0	3.0–3.5
Herkimer silt loam, acid, 8 to 15 percent slopes	Medium.	Low.	6.0	----------	1.0–1.5	1.5–2.0
Howard loam, 8 to 15 percent slopes	Medium.	Medium.				
Kars gravelly loam, 8 to 15 percent slopes	Medium.	High.				
Mohawk silt loam, 8 to 15 percent slopes	Medium.	High.				
Nellis loam, deep, 8 to 15 percent slopes	Medium.	High.				
Nellis loam, moderately deep, 8 to 15 percent slopes	Medium.	High.				
Poland silt loam, 8 to 15 percent slopes	Medium.	Medium.				

Cropping systems [2]	Supporting practices according to length of slope [3]: *300 feet*	*400 feet*	*600 feet*
Rc–Rc–C–S–S	Contour cultivation	Contour cultivation, diversion terraces.	Contour strips, diversion terraces.
R–C–S–S	Contour cultivation	Same	Same.
R–C–S–S–S	Contour cultivation	Contour cultivation	Contour strips.
R–C–S–S–S–S	Contour cultivation	Contour cultivation	Contour strips.
C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
S–S–S–S	Not needed	Not needed	Not needed.

[1] For definitions, see section, Some Steps to Good Management.

[2] Rc=row crop with a cover crop; C=close-growing crop; S=sod-forming crop; R=row or intertilled crops.

[3] On Nellis loam, moderately deep, 8 to 15 percent slopes, use cropping systems that do not require use of diversion terraces as a supporting practice; on all of the soils, where soils are irregular and contour tillage is impractical, use the last three rotations.

TABLE 15.—*Soils of management group 15, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Colonie fine sandy loam, 8 to 15 percent slopes	Low.	Low.	5.0	2.0–2.5	2.5–3.0	3.0–3.5
Melrose sandy loam, 6 to 12 percent slopes	Low.	Low.	5.5	1.0–1.5	1.5–2.0	2.0–2.5
Petoskey fine sandy loam, 8 to 15 percent slopes	Low.	High.	6.0		1.0–1.5	1.0–1.5

Cropping systems [2]	Supporting practices according to length of slope [3]		
	300 feet	*400 feet*	*600 feet*
R-C-S-S	Cross-slope cultivation	Contour cultivation; diversion terraces.	Contour strips; diversion terraces.
R-C-S-S-S	Cross-slope cultivation	Contour cultivation	Contour strips.
R-C-S-S-S-S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
C-S-S-S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
S-S-S-S	Not needed	Not needed	Not needed.

[1] For definitions, see section, Some Steps to Good Management.
[2] R=row or intertilled crop; C=close-growing crop; S=sod-forming crop.
[3] Use windbreaks where there is evidence of soil blowing; many areas have complex slopes and require cropping systems that do not need to be supported by contour tillage; generally, at least 2 years of sod-forming crops are best, and where feasible, cover crops should be used.

The soils in this group are listed in table 15 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—These soils have a moderate to low supply of nitrogen. They have a moderate supply of phosphorus and are low in available potassium. The supply of plant nutrients decreases rapidly under poor management. If the soils are limed adequately, the phosphorus may become more available and the potassium less available. Consequently, tests are needed to determine the specific amounts of phosphate and potash required.

Lime needs.—The Colonie and Melrose soils are strongly acid to very strongly acid throughout the rooting zone. The upper layers of the Petoskey soil range from neutral to medium acid. Tests are needed to determine the specific requirements of the soils for lime.

Suitability for crops and pastures.—All of the soils in this group require use of cropping systems that best conserve the soil. Because the soils are somewhat droughty, they are best suited to deep-rooted crops and annuals that make much of their growth early in spring. Of the row crops, corn is grown the most frequently, although vegetables also grow well. Generally, it is best to plant crops that are not expensive to grow, since yields are not high. The soils are suited to either wheat or oats. Of the sod-forming crops, alfalfa or birdsfoot trefoil and other deep-rooted legumes give the best yields.

Deep-rooted pasture plants grow best on these soils. Unless the season is unusually wet, pastures are the most productive early in summer.

Suitability for planting trees.—Black locust, hybrid poplar, and other hardwoods common to the area can be planted on the more fertile parts of the Colonie and Petoskey soils. The soils are suited to most conifers. It is best not to plant red pine on areas of the Petoskey soil that have a neutral or alkaline surface layer, although Austrian pine will grow well on such areas.

MANAGEMENT GROUP 16

Well-drained, sloping, strongly acid soils.

The soils in this group are deep, well drained, sloping, and strongly acid. They have all formed on glacial till, and all but the Gloucester soils have a firm to very firm fragipan at depths below about 20 inches. The soils are low in plant nutrients but are high in ability to supply moisture. The risk of erosion is moderate, and practices are needed to control runoff. Within the group, the Pinckney soil is the most erodible.

All of the soils in this group respond well to good management. The soils are listed in table 16 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group have a slightly lower than moderate supply of nitrogen. They have a moderate to slightly lower supply of phosphorus. Except for the Pinckney soil and Worth flaggy silt loam, 8 to 15 percent slopes, which have a moderate supply, the soils are low in potassium. Because liming may increase the need of the soils for potash and decrease the need for phosphate, the soils should be tested to determine the specific needs before applying fertilizer.

Lime needs.—The neutral substratum phase of the Gloucester soils has a neutral zone at depths within reach of deep-rooted crops. All of the other soils are strongly acid to very strongly acid throughout the rooting zone. Tests are needed to determine the specific needs of the soils for lime.

Suitability for crops and pastures.—Low fertility, moderate slopes, and stoniness limit the use of the soils in this group for crops. Large amounts of lime and fertilizer are needed, but yields are generally not high enough to justify the cost. Corn is the most commonly grown crop, and under good management it produces good yields. The soils are well suited to wheat and oats. For forage

crops, deep-rooted legumes are the best to use on these soils.

All of these soils are fairly well suited to pasture, but they require adequate lime and fertilizer. Rotation pastures generally give better yields than renovated native pastures or permanent pastures. The soils are somewhat droughty in midsummer; consequently, deep-rooted legumes are better for pastures than the clovers.

Suitability for planting trees.—These soils are well suited to red, white, and Scotch pine, European and Japanese larch, and Norway and white spruce. Black locust and hybrid poplar, grown for commercial use, are best on the neutral substratum phase of the Gloucester soils. Balsam fir, Austrian pine, and Douglas-fir can be grown for Christmas trees.

MANAGEMENT GROUP 17

Highly erodible, very strongly acid soils.

The soils of this management group are very strongly acid. They are deep and free of stones but are highly erodible. The Hartland soil is a uniform very fine sandy loam throughout, but Suffield and Hudson silt loams, 6 to 12 percent slopes, has a subsoil of silty clay. The soils are high in available moisture-holding capacity and are permeable enough to permit the deep rooting of plants.

It is important to maintain a good supply of organic matter; otherwise, these soils will become subject to crusting, less permeable, and poorly aerated. The organic matter will also help to maintain good structure. These soils require practices to control runoff so that water will be conserved and erosion prevented. They respond well to management.

The soils in this group are listed in table 17 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group have a moderate supply of nitrogen and phosphorus. The Suffield and Hudson silt loams of this group are medium in their ability to supply potassium, but the Hartland soil is somewhat lower. When the soils are adequately limed, the potash needs of the soils may increase and the need for phosphate may decrease. Tests are needed to determine the specific requirements of the soils for potash and phosphate.

Lime needs.—The Hartland soil ranges from very strongly acid to slightly acid in reaction. Of the Suffield and Hudson silt loams, the Hudson soil is slightly acid to medium acid in the upper layers but calcareous within reach of plant roots, and the Suffield is medium acid throughout. Tests are needed to determine the specific requirements of the soils for lime.

Suitability for crops and pastures.—The soils are suited to all of the crops commonly grown in the county, but yields are about 10 percent lower than on less sloping soils. Because the soils are susceptible to erosion and crusting, it is best to plant crops that require little tillage. Of the row crops, corn grows well. The soils are well suited to either oats or wheat. Of the forage crops, they are best suited to the deep-rooted legumes. The Hartland soil is best suited to intensive use for cash crops. All the soils require good management when used for row crops.

Generally, rotation pastures are more productive on these soils than renovated native pastures or long-term pastures. The soils are suited to both deep- and shallow-rooted legumes. Deep-rooted legumes, however, are more

TABLE 16.—*Soils of management group 16, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—[2]		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Essex stony fine sandy loam, 8 to 15 percent slopes	Low.	Low.	5.0	2.5–3.0	3.5–4.0	4.0–4.5
Gloucester fine sandy loam, neutral substratum, 8 to 15 percent slopes.	Low.	Low.	5.5	1.5–2.0	2.0–2.5	2.5–3.0
Gloucester stony fine sandy loam, 8 to 15 percent slopes	Low.	Low.	6.0	----------	1.0–1.5	1.5–2.0
Pinckney silt loam, 8 to 15 percent slopes	Medium.	Low.				
Worth stony loam, 8 to 15 percent slopes	Low.	Low.				
Worth flaggy silt loam, 8 to 15 percent slopes	Medium.	Low.				

Cropping systems [3]	Supporting practices according to length of slope [4]		
	300 feet	*400 feet*	*600 feet*
R–C–S–S	Cross-slope cultivation	Contour cultivation	Contour strips.
R–C–S–S–S	Cross-slope cultivation	Contour cultivation	Contour cultivation.
R–C–S–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
S–S–S–S	Not needed	Not needed	Not needed.

[1] For definitions, see section, Some Steps to Good Management.

[2] Increase amounts by about 25 percent for the Pinckney soil and for Worth flaggy silt loam, 8 to 15 percent slopes.

[3] R=row or intertilled crop; C=close-growing crop; S=sod-forming crop.

[4] On slopes longer than 400 feet, for first rotation use diversion terraces on the Pinckney soil and on Worth flaggy silt loam, 8 to 15 percent slopes; where slopes are complex use last two rotations only.

TABLE 17.—*Soils of management group 17, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—[2] pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Hartland very fine sandy loam, 6 to 12 percent slopes	Low.	Low.	5. 0	4. 0–4. 5	5. 0–5. 5	5. 5–6. 0
Suffield and Hudson silt loams, 6 to 12 percent slopes	Medium.	Low.	5. 5	2. 5–3. 0	3. 0–3. 5	3. 5–4. 0
			6. 0		1. 0–1. 5	1. 5–2 0

Cropping systems [3]	Supporting practices according to length of slope[4] 300 *feet*	400 *feet*	600 *feet*
R–C–S–S	Cross-slope cultivation	Contour cultivation, diversion terraces.	Contour strips, diversion terraces.
Rc–C–S–S	Cross-slope cultivation	Contour cultivation	Contour strips.
R–C–S–S–S	Cross-slope cultivation	Contour cultivation	Contour strips.
Rc–C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultlvation.
S–S–S–S	Not needed	Not needed	Not needed.

[1] For definitions, see section, Some Steps to Good Management.
[2] For the Hartland soil, decrease amount by about 25 percent.
[3] R=row or intertilled crop; C=close-growing crop; S=sod-forming crop; Rc=row crop with a cover crop.
[4] Wherever feasible, use cover crops; on complex slopes use cropping systems that do not require contour tillage as a supporting practice.

productive in midsummer. Any good mixture suitable for pastures on well-drained soils can be used for seeding.

Suitability for planting trees.—Black locust and other hardwoods commonly planted in the area can be grown on these soils providing the surface layer is sufficiently fertile. The soils are well suited to most conifers. Hybrid poplar and red pine, however, should not be planted where the subsoil is slowly permeable or on less well drained areas associated with these soils.

MANAGEMENT GROUP 18

Sloping soils underlain by a strong pan or clayey subsoil.

The soils in this group are moderately well drained to somewhat poorly drained. They all have a high available moisture-holding capacity. Internal drainage is restricted by a strong pan or a clayey subsoil. The Camroden, Empeyville, and Turin soils all have formed on glacial till. The Camroden and Empeyville soils have strong pans, but the Turin soil has a clayey subsoil that overlies compact glacial till. The Rhinebeck soil, formed on lake-laid sediments, has a clayey subsoil and substratum.

The soils all have steep slopes. Runoff is rapid, and the hazard of erosion is high. The Rhinebeck soil is more erodible than the other soils of the group. Because of the restricted drainage, crops that can be grown on these soils are limited. All of the soils require practices to control erosion and to maintain the supply of plant nutrients. The wetter areas of Camroden, Rhinebeck, and Turin soils require special practices to improve drainage.

The soils in the group are listed in table 18 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The Camroden and Empeyville soils have a low supply of nitrogen and a moderate supply of phosphorus. The Rhinebeck and Turin soils have a moderate supply of both nitrogen and phosphorus. Except for Empeyville stony loam, 8 to 15 percent slopes, which is low in potassium, and the Rhinebeck soil, which is high, the soils all have a moderate supply of potassium. Before fertilizer is applied, the soils need to be tested to determine the specific requirements for these elements.

Lime needs.—The Camroden and Empeyville soils are very strongly acid throughout the rooting zone. They require initial applications of lime in the amounts needed for a soil test of pH 5.0. In contrast, the Rhinebeck and Turin soils have a slightly acid to strongly acid plow layer, but lime occurs in the substratum within reach of deep-rooted plants. It is best to have the soils tested to determine the specific requirements for lime.

Suitability for crops and pastures.—Because of seasonal wetness, stoniness, the hazard of erosion, and the low supply of plant nutrients, the soils of this group are limited in their use for crops. Generally, yields are not high enough to justify using intensive management practices. The soils are best suited to crops grown in support of dairy farming. If the soils are well managed, corn grown for silage, small grains, and hay make good yields. Of the hay crops, the soils are best suited to shallow-rooted legumes, birdsfoot trefoil, and varieties of alfalfa that tolerate seasonal wetness. Within the group, the Turin soil is the most productive.

The soils are suited to pasture, but the Camroden and Empeyville soils require more intensive management than the other soils of the group. Because all of the soils are periodically wet, especially in spring, it is best to grow water-tolerant plants for spring pasture. On the other hand, it is best to grow the deep-rooted plants for midsummer pasture because the soils are subject to drought in this season. Rotation pastures are most productive on all of the soils. The Rhinebeck and Turin soils are better suited to permanent pasture than the Camroden and Empeyville. Adequate lime and fertilizer are needed on all the pastures to make good yields.

TABLE 18.—*Soils of management group 18, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—[2] pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Camroden silt loam, 8 to 15 percent slopes	Medium.	Low.	5. 0	3. 5–4. 0	4. 5–5. 0	5. 0–5. 5
Empeyville flaggy silt loam, 8 to 15 percent slopes	Medium.	Low.	5. 5	2. 0–2. 5	2. 5–3. 0	3. 0–3. 5
Empeyville stony loam, 8 to 15 percent slopes	Low.	Low.	6. 0	----------	1. 0–1. 5	1. 5–2. 0
Rhinebeck silt loam, 6 to 12 percent slopes	High.	Medium.				
Turin silt loam, 8 to 15 percent slopes	Medium.	Medium.				

Cropping systems for— [3]	Supporting practices for soils according to slope [4]: *300 feet*	*400 feet*	*600 feet*
Moderately well drained areas:			
R–C–S–S	Cross-slope cultivation	Contour cultivation; diversion terraces.	Contour strips; diversion terraces.
R–C–S–S–S	Cross-slope cultivation	Contour cultivation	Contour strips.
R–C–S–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
Somewhat poorly drained areas:			
R–C–S–S	Cross-slope cultivation	Drainage diversions	Grade strips; drainage diversions.
R–C–S–S–S	Cross-slope cultivation	Drainage diversions	Drainage diversions.
C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
S–S–S–S	Not needed	Not needed	Not needed.

[1] For definitions, see section, Some Steps to Good Management.
[2] For the Rhinebeck soil, increase amounts by about ½ ton.
[3] R=row or intertilled crop; C=close-growing crop; S=sod-forming crop.
[4] Where slopes are complex, use only those cropping systems that do not require contour cultivation or grading as a supporting practice.

Suitability for planting trees.—Generally, the soils of this group are suited to white and Scotch pine, European and Japanese larch, white and Norway spruce, and balsam fir. Of these, white pine and spruce grow best on the somewhat poorly drained areas. Red pine will grow only on the best drained areas.

MANAGEMENT GROUP 19

Poorly drained to somewhat poorly drained, gently sloping soils.

The soils of this group are poorly drained to somewhat poorly drained. They are medium textured and have gentle slopes. The supply of plant nutrients varies widely in the soils. Except for the Scantic soil, which has formed on lake-laid silts and clays, the soils have formed on glacial till. The Ilion and Scantic soils have a clayey subsoil and the Kendaia overlies firm glacial till. The Gage, Marcy, and Westbury soils have a fragipan. Because seepage water accumulates over the slowly permeable layer, all the soils of the group are wet. They are also subject to erosion. The Scantic soil is the most erodible of the group.

The soils in this group are listed in table 19 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group are medium or slightly higher in nitrogen, but they release the nitrogen slowly in the spring. They have a moderate supply of phosphorus. The Gage and Kendaia soils are medium in available potassium, and the other soils are high. After lime is added to the Gage and Westbury soils, the need for phosphate may decrease and the need for potash may increase. Before fertilizer is applied, the soils need to be tested to determine the specific amounts of phosphate and potash they require.

Lime needs.—The Gage, Scantic, and Westbury soils are acid throughout the rooting zone. They initially require lime in the amounts needed for a soil testing pH 5.0. The surface layer of the Marcy soil is strongly acid to medium acid, but in the Ilion and Kendaia soils, this layer is medium acid to neutral. The Ilion, Kendaia, and Marcy soils in some places have a calcareous subsoil, and the Ilion and Kendaia soils normally require little lime. It is best to test all of the soils in the group to determine the specific amounts of lime needed.

Suitability for crops and pastures.—These soils are subject to erosion and are inadequately drained. They are best suited to crops that tolerate periodic wetness or that are planted late in spring. Generally, the response to management is lower than for the better drained soils. Consequently, it is best to plant crops that are not costly to maintain. Corn for silage, small grains, and hay are among the crops to which they are best suited. Of the legumes, the best suited are ladino clover, birdsfoot trefoil, and water-tolerant varieties of alfalfa.

If adequately limed and fertilized, these soils are well suited to pasture. Because of wetness, grazing is abundant in spring and lasts into the summer. The shallow-rooted legumes are the best for pasture, but birdsfoot trefoil also grows well. Although rotation pastures are best on these soils, permanent pastures yield well on the Ilion, Kendaia, and Marcy soils.

TABLE 19.—*Soils of management group 19, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach— pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Gage silt loam, 3 to 8 percent slopes	Medium.	Low.	5. 0	4. 0–4. 5	5. 0–5. 5	5. 5–6. 0
Ilion silt loam, 3 to 8 percent slopes	High.	High.	5. 5	2. 5–3. 0	3. 0–3. 5	3. 5–4. 0
Kendaia silt loam, 3 to 8 percent slopes	Medium.	High.	6. 0	----------	1. 0–1. 5	1. 5–2. 0
Marcy silt loam, 3 to 8 percent slopes	High.	Medium.				
Scantic silt loam, 0 to 6 percent slopes	High.	Low.				
Westbury stony loam, 3 to 8 percent slopes	High.	Low.				

Cropping systems [2]	Supporting practices according to length of slope [3] — *300 feet*	*400 feet*	*600 feet*
R–C–S–S	Cross-slope cultivation	Drainage diversions	Drainage diversions; grade strips.
R–C–S–S–S	Cross-slope cultivation	Drainage diversions	Drainage diversions.
R–C–S–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
S–S–S–S	Not needed	Not needed	Not needed.

[1] For definitions, see section, Some Steps to Good Management.
[2] R=row or intertilled crop; C=close-growing crop; S=sod-forming crop.
[3] For the Scantic soil, if slopes are less than 3 percent, use open ditch drainage or bedding with the first 3 rotations listed; for the other soils of the group, if slopes are near 3 percent, use drainage diversions in place of practices listed; for the Kendaia soil if slopes are gentle, tile drainage is generally feasible, but it is difficult to establish on the other soils because of pans or heavy subsoils.

Suitability for planting trees.—Because of wetness, the soils of this group are of limited value for trees. The better drained areas can be planted to white pine and Scotch pine for use as Christmas trees or as a ground cover. Generally, where the surface soil is neutral or acid, white and Norway spruce and balsam fir can be grown. White-cedar is best on areas where the surface soil is alkaline.

Subclass IIIw.—Soils that have severe limitations because of excess water.

MANAGEMENT GROUP 20

Nearly level, somewhat poorly drained soils.

In this management group are nearly level, somewhat poorly drained soils that have formed on glacial till. The supply of plant nutrients varies widely in the soils. The Kendaia soil overlies firm, calcareous glacial till; the Ridgebury and Westbury soils have a strong pan at depths below 18 inches. All of the soils are seasonally wet. Generally, the Kendaia soil occupies wet areas in fields that are predominantly better drained. The Ridgebury and Westbury soils, however, normally occupy larger areas than the Kendaia soil. Because the Ridgebury and Westbury soils are stony and have a fragipan, it is less feasible to use tile drainage on them than on the Kendaia soils. Either tile or open ditch drainage can be used on the Kendaia soil.

The soils in this group are listed in table 20 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

TABLE 20.—*Soils of management group 20, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach— pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Kendaia silt loam, 0 to 3 percent slopes	Medium.	High.	5. 0	3. 5–4. 0	4. 5–5. 0	5. 0–5. 5
Ridgebury stony loam, 0 to 5 percent slopes	Low.	Low.	5. 5	2. 0–2. 5	2. 5–3. 0	3. 0–3. 5
Westbury stony loam, 0 to 3 percent slopes	Low.	Low.	6. 0	----------	1. 0–1. 5	1. 5–2. 0

Cropping systems [2]	Supporting practices
R–C–S–S; R–C–S–S–S; C–S–S–S; S–S–S–S	Tile or open drainage ditches required for all. [3]

[1] For definitions, see section, Some Steps to Good Management.
[2] R=row or intertilled crop; C=close-growing crop; S=sod-forming crops.
[3] On the Kendaia soil, either tile or open ditch drainage can be used, but tile drainage may not be feasible on the other soils of this group.

Fertility.—The soils in this group are medium or slightly higher in nitrogen, but they release the nitrogen slowly in the spring. They have a moderate supply of phosphorus. The Kendaia soil is medium in available potassium, but the other soils in the group are low. After lime is added to the Ridgebury and Westbury soils, the need for phosphorus may decrease and the need for potash may increase. Before applying fertilizer the soils need to be tested to determine the specific amounts of phosphate and potash they require.

Lime needs.—The Ridgebury and Westbury soils are acid throughout the rooting zone. They initially require lime in the amounts needed for a soil testing pH 5.0. The plow layer of the Kendaia soil is neutral, and free lime occurs at depths of 18 to 30 inches. Normally, this soil needs no lime, but all of the soils should be tested before applying lime.

Suitability for crops and pastures.—Unless these soils are adequately drained, they are best suited to crops grown in support of dairy farming. When the Kendaia soil is drained, it is suited to most of the crops grown in the county, and the crops produce high yields. The Ridgebury and Westbury soils are hard to drain. Furthermore, they are stony and have a low supply of plant nutrients. It is best not to use them for crops that are costly to grow. Typically, the use of tillage, road ditches, and open ditches in fields provides drainage so that the soils are suitable for a rotation of corn, oats, and hay. The yields of oats are generally low, however, because of late planting. Of the legumes, the soils are best suited to ladino clover and birdsfoot trefoil. If the soils are adequately fertilized, they are also suited to the more water-tolerant varieties of alfalfa.

Because of wetness, the soils are best suited to water-tolerant pasture plants. Shallow-rooted plants are less subject to damage from drought on these soils than on most of the soils of the county. The Kendaia soil is one of the best soils for pasture and is well suited to permanent pasture. Generally, the Ridgebury and Westbury soils are better suited to rotation pastures then to permanent pastures. They require heavy applications of lime and fertilizer for good yields.

Suitability for planting trees.—The Kendaia soil is best suited to whitecedar and white spruce, and the Ridgebury and Westbury soils, to white pine and white, red, and Norway spruce. Balsam fir will grow well for use as Christmas trees. The areas that have not been plowed are hummocky, and the soils in these places are better able to support plant growth than the other areas. Here, larches can be planted.

MANAGEMENT GROUP 21

Nearly level, somewhat poorly drained and poorly drained soils.

The soils of this group are sandy, nearly level, and somewhat poorly drained to poorly drained. They differ widely. The Junius soil is nearly neutral and is sandy. The Saugatuck is very strongly acid and sandy and has an iron-cemented pan just below the plow layer. The Swanton is neutral to acid and is sandy. It overlies silt and clay at depths of 18 to 40 inches. The Walpole is an acid, deep loam that overlies sand. All of the soils are wet and require drainage if they are used for crops. They all require fertilizing for even fair yields.

The soils in the group are listed in table 21 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—All of the soils in this group have a moderate supply of nitrogen, but they are slow to release it in spring. They have a moderate to slightly lower supply of phosphorus, but the phosphorus in the Saugatuck soil is strongly fixed. The soils all have a low supply of potassium. After lime is added, the acid soils may need more potash. Before applying fertilizer it is best to test the soils to determine the specific amounts of phosphate and potash needed.

Lime needs.—The Junius soil is normally nearly neutral throughout the rooting zone, and the Swanton is neutral

TABLE 21.—*Soils of management group 21, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—[2]		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Junius fine sandy loam, 0 to 3 percent slopes	Low.	High.	4.5	2.5–3.0	3.5–4.0	4.0–4.5
Saugatuck loamy fine sand, 0 to 3 percent slopes	Low.	Low.	5.0	2.0–2.5	2.5–3.0	3.0–3.5
Swanton fine sandy loam, 0 to 2 percent slopes	Low.	Medium.	5.5	1.0–1.5	1.5–2.0	2.0–2.5
Walpole loam, 0 to 4 percent slopes	Low.	Low.	6.0		1.0–1.5	1.0–1.5

Cropping systems [3]	Supporting practices [4]
Rc–Rc–C–S–S; Rc–C–S–S; Rc–C–S–S–S; C–S–S–S; S–S–S–S.	Use open ditch or tile drainage for all.

[1] For definitions, see section, Some Steps to Good Management.

[2] For Saugatuck, decrease amounts greater than 1 ton by about 30 percent.

[3] Rc=row crop with a cover crop; C=close-growing crop; S=sod-forming crop.

[4] Precautions should be taken to prevent caving of ditchbanks or tile-line trenches.

to acid. The other soils are acid throughout. The soils need to be tested to determine their specific requirements for lime.

Suitability for crops and pastures.—When adequately drained, the soils are suited to most of the cash crops generally grown in the county. Because of its low supply of plant nutrients and iron-cemented pan, the Saugatuck is the only soil of the group that is somewhat limited for crops. Most of the soils are easily drained. Consequently, even when the soils are drained only by road ditches, dead furrows, and an occasional field ditch, corn, small grains, hay, and some late, special crops can be grown. Because of wetness, it may be necessary to plant spring grain crops somewhat late. Therefore, yields are lowered. In some years all but the most water-tolerant crops are damaged by wetness. The soils all require fertilizer for best yields, and all but the Saugatuck are highly responsive.

When these soils are adequately drained, they are generally too valuable for crops to be used for permanent pasture, although they can be used for rotation pasture. If they are adequately limed and fertilized, undrained or partly drained areas are suited to shallow-rooted and water-tolerant, deep-rooted pasture plants and provide good grazing in midsummer. Improved native pastures are productive on the Junius soil and are moderately productive on the Swanton and Walpole soils. They are difficult to establish and maintain on the Saugatuck soil.

Suitability for planting trees.—The soils of this group are generally suited to white pine, white, red, and Norway spruce, and to balsam fir grown for Christmas trees. Although the Saugatuck soil is unsuited to other kinds of spruce, red spruce can be planted on the less fertile areas that are not so exposed to freezing.

MANAGEMENT GROUP 22

Nearly level, very poorly drained soils.

The soils in this group are nearly level, very poorly drained, and sandy. Their content of organic matter is high. Normally, the water table in all of the soils is at or near the surface. The Granby soil is deep and is slightly acid to neutral. It has a calcareous substratum. The Scarboro soils are deep, but one phase is neutral and noncalcareous, and the other is acid throughout. The Whately soil is slightly acid to neutral and overlies clay. If the soils are used for crops or pasture, they require drainage and practices to maintain fertility.

The soils are listed in table 22 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group are high in nitrogen, but they release it slowly in spring. They are medium in their ability to supply phosphorus but are low in their ability to supply potassium. Except for the Granby soil, all of the soils may need more potash after lime is applied. The soils need to be tested to determine the specific amounts of phosphate and potash needed.

Lime needs.—The Granby soil normally requires no lime. The other soils in this group are acid and need to be tested to determine the specific amounts of lime they require.

Suitability for crops and pastures.—The suitability of these soils for crops depends upon the degree of drainage. In some areas the soils are suited only to water-tolerant plants grown for hay. In other areas they are suited to all the crops commonly grown in the county. If they are adequately drained, deep-rooted plants grow well on these soils, but if they are overdrained they become too

TABLE 22.—*Soils of management group 22, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—[2] pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Granby fine sandy loam, 0 to 2 percent slopes	Low.	High.	5.0	2.5–3.0	3.0–3.5	3.5–4.0
Scarboro fine sandy loam, 0 to 2 percent slopes	Low.	Medium.	5.5	1.5–2.0	2.0–2.5	2.5–3.0
Scarboro loamy sand, neutral phase, 0 to 2 percent slopes	Low.	Low.	6.0	----------	1.0–1.5	1.5–2.0
Whately fine sandy loam, 0 to 2 percent slopes	Low.	Low.				

Cropping systems [3]	Supporting practices [4]
Rc–Rc–C–S–S	Intensive use of ditch or tile drainage.
Rc–C–S–S	Intensive use of ditch or tile drainage.
R–C–S–S–S	Ditch or tile drainage.
C–S–S–S	Ditch or tile drainage.
S–S–S–S	Ditch or tile drainage.

[1] For definitions, see section, Some Steps to Good Management.

[2] If the content of organic matter is less than 4 percent, use ½ ton less than suggested for all amounts greater than 2 tons. If it is more than 6 percent, use ½ ton more.

[3] Rc=row crop with a cover crop; C=close-growing crop; S=sod-forming crop; R=row or intertilled crops.

[4] Care should be taken to prevent the caving of ditchbanks or tile-line trenches. When the soils are drained, cover crops are needed to maintain organic matter and to conserve fertilizer.

droughty for some plants. When adequately drained they respond well to management, and yields are good.

If these soils are not drained, they are suited only to pasture plants that tolerate extreme wetness, and pastures on them are difficult to improve. If the soils are partly drained, they can be seeded to mixtures that include shallow-rooted legumes. If they are completely drained, deep-rooted plants grow well on these soils, but if the soils are overdrained they become too droughty for some plants. The soils require large amounts of lime and fertilizer for good pasture yields, but if properly drained they are very productive.

Suitability for planting trees.—Unless the soils of this group have been drained or are still unplowed, it is somewhat risky to plant trees on them. The neutral and alkaline soils are best suited to whitecedar. White and Norway spruce and balsam fir can be planted on the acid to neutral, somewhat better drained areas. On the unplowed, hummocky areas, white pine can be planted, particularly along with other trees.

Subclass IIIs.—Soils that have severe limitations because of unfavorable depth or texture.

MANAGEMENT GROUP 23

Well-drained to excessively drained soils.

The soils of this group are deep and are well drained to excessively drained. They are sandy or gravelly. The soils are generally droughty and are low in plant nutrients. If they are left without cover, they are subject to wind erosion. Yields are low unless supplemental irrigation is supplied, and in many places the soils are best suited to trees. Trees do not grow well in some places, however, because the soil is too low in plant nutrients.

The soils in this group are listed in table 23 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—These soils are low in nitrogen and are medium to low in phosphorus. They are very low in ability to supply potassium, and they may be deficient in minor elements. Before fertilizer is applied, the soils need to be tested to determine the specific amounts of phosphate and potash they require.

Lime needs.—The upper layers of the Bonaparte soil are neutral to medium acid, but free lime occurs at depths between 18 and 30 inches. The Hinckley soils have a medium acid to very strongly acid solum that overlies a neutral substratum. All of the other soils in the group are very strongly to extremely acid throughout the rooting zone. Tests are needed to determine the specific requirements of the soils for lime.

Suitability for crops and pastures.—These soils are droughty, and their use for crops is limited unless supplemental irrigation is supplied. Generally, they are best suited to corn, oats, and deep-rooted legumes that tolerate soils of low fertility. The soils do not respond well to management; therefore, it is best to plant crops that are not costly to grow. In some places early maturing cash crops will grow well if they are planted early so that they can be harvested before they are damaged by drought. Shallow-rooted sod crops yield little after they have made a rapid, abundant growth in early spring. Even under the best management, yields are not high. Many areas are best suited to trees.

The soils are poorly suited to pastures. Grazing may be good in spring, but during midsummer and fall, it generally is poor. The pastures should be seeded to deep-rooted plants that tolerate low fertility. Even

TABLE 23.—*Soils of management group 23, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Adams loamy fine sand, 0 to 3 percent slopes	Very low.	Low.	4.5	1.5–2.0	2.0–2.5	2.5–3.0
Adams loamy fine sand, 3 to 8 percent slopes	Very low.	Low.	5.0	1.0–1.5	1.5–2.0	2.0–2.5
Adams and Colton soils, morainic, 3 to 8 percent slopes	Very low.	Low.	5.5	1.0	1.0–1.5	1.5–2.0
Bonaparte gravelly sandy loam, 2 to 8 percent slopes	Very low.	High.	6.0	----------	1.0	1.0
Colosse gravelly fine sandy loam, 2 to 8 percent slopes	Very low.	Low.				
Colosse cobbly loamy fine sand, 2 to 8 percent slopes	Very low.	Low.				
Colton loamy fine sand, 0 to 3 percent slopes	Very low.	Low.				
Colton loamy fine sand, 3 to 8 percent slopes	Very low.	Low.				
Colton gravelly loamy sand, 0 to 8 percent slopes	Very low.	Low.				
Hinckley sandy loam, neutral substratum, 0 to 3 percent slopes.	Very low.	Medium.				
Hinckley sandy loam, neutral substratum, 3 to 8 percent slopes.	Very low.	Medium.				

Cropping systems [2]	Supporting practices [3]
Rc–C–S–S; Rc–C–S–S–S; C–S–S–S; S–S–S–S	Windbreaks and cross-slope cultivation required for all rotations.

[1] For definitions, see section, Some Steps to Good Management.
[2] Rc=row crop with a cover crop; C=close-growing crop; S=sod-forming crop.
[3] Cover crops are necessary to conserve fertilizer, to maintain organic matter, and to prevent soil blowing.

TABLE 24.—*Soils of management group 24, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Adams loamy fine sand, 8 to 15 percent slopes	Very low.	Low.	4.5	1.5–2.0	2.0–2.5	2.5–3.0
Adams and Colton soils, morainic, 8 to 15 percent slopes	Very low.	Low.	5.0	1.0–1.5	1.5–2.0	2.0–2.5
Bonaparte gravelly sandy loam, 8 to 15 percent slopes	Very low.	High.	5.5	1.0	1.0–1.5	1.5–2.0
Colosse cobbly loamy fine sand, 8 to 15 percent slopes	Very low.	Low.	6.0	----------	1.0	1.0
Colton loamy fine sand, 8 to 15 percent slopes	Very low.	Low.				
Colton gravelly loamy sand, 8 to 15 percent slopes	Very low.	Low.				
Gloucester stony sandy loam, 8 to 15 percent slopes	Low.	Low.				
Hinckley sandy loam, neutral substratum, 8 to 15 percent slopes.	Very low.	Medium.				

Cropping systems [2]	Supporting practices according to length of slope [3]		
	300 feet	*400 feet*	*600 feet*
Rc–C–S–S	Cross-slope cultivation	Contour cultivation	Contour strips.
Rc–C–S–S–S	Cross-slope cultivation	Contour cultivation	Contour cultivation.
Rc–C–S–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
C–S–S–S	Cross-slope cultivation	Cross-slope cultivation	Cross-slope cultivation.
S–S–S–S	Not needed	Not needed	Not needed.

[1] For definitions, see section, Some Steps to Good Management.
[2] Rc=row crop with a cover crop; C=close-growing crop; S=sod-forming crop.
[3] Windbreaks are needed wherever there is evidence of soil blowing.

though lime and fertilizer are added, yields of native pastures are low.

Suitability for planting trees.—Generally, these soils are suited to pines and larches, and the roots of these trees penetrate to depths between 8 and 12 feet. Nevertheless, because the soils are low in plant nutrients and the level areas that have a sandy texture are subject to severe freezing, it is difficult to establish plantings in some places. Soils that have a substratum of fine sand or that have layers of silt or calcareous material within 8 feet of the surface are suitable for red and Scotch pine and European and Japanese larch if freezing is not severe. They are also suited to white pine, provided pine weevil is controlled.

Trees planted on the less fertile areas may need fertilizer, particularly potash, for satisfactory early growth. Soils that have an acid substratum of coarse or gravelly sand lack plant nutrients, and on these soils trees do not grow well. In such areas and on eroded or blown-out areas, it is best to plant only Scotch or jack pine unless fertilizer is applied.

The Bonaparte soil and the Colosse and Hinckley soils are better suited to trees than the other soils of the group. In addition to the trees mentioned, these soils are also suited to white and Norway spruce and to balsam fir grown for Christmas trees.

MANAGEMENT GROUP 24

Sloping or rolling, droughty soils.

The soils in this group are sloping or rolling and are coarse textured and droughty. All of the soils are low in plant nutrients and in ability to hold available moisture. When soluble fertilizer is added, it is leached away rapidly. The hazard of erosion is moderate. Although these soils can be used for crops, they are not well suited to pasture or hay. Crops grown on them do not yield well. The principal alternative use is for forestry.

The soils in this group are listed in table 24 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group are low in nitrogen. Their supply of phosphorus is moderate or lower, and the soils are very low in potassium. They need to be tested to determine the specific amounts of phosphate and potash they require. The soils may also be deficient in minor plant nutrients.

Lime needs.—Although the Bonaparte soil normally requires no lime, all of the soils should be tested to determine the specific amounts of lime needed if they are to be used for crops or pasture.

Suitability for crops and pastures.—These soils are droughty, and their use for crops is limited. If the soils must be used for crops, the best ones to plant are corn, small grains, and the more drought resistant of the sod crops. It is best to plant legumes that tolerate soils of low fertility.

If these soils are used for pasture, they should be seeded to deep-rooted plants that grow well on soils of low fertility. Generally, spring grazing is fair, but grazing is poor in midsummer and in fall. Yields of native pastures are low even when the soils are limed and fertilized.

Suitability for planting trees.—These soils generally are suited to red, Scotch, and white pine and to European and Japanese larch. White and Norway spruce and balsam fir to be used as Christmas trees can be grown only on the

TABLE 25.—*Soils of management group 25, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach— pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Croghan loamy fine sand, 0 to 5 percent slopes	Very low.	Low.	4.5	1.5–2.0	2.0–2.5	2.5–3.0
Duane sandy loam, 0 to 5 percent slopes	Very low.	Low.	5.0	1.0–1.5	1.5–2.0	2.0–2.5
			5.5	1.0	1.0–1.5	1.5–2.0
			6.0		1.0	1.0

Cropping systems [2]	Supporting practices [3]
Rc–C–S–S; Rc–C–S–S–S; C–S–S–S; S–S–S–S	Windbreaks; drainage.

[1] For definitions, see section, Some Steps to Good Management.
[2] Rc=row crop with a cover crop; C=close-growing crop; S=sod-forming crop.
[3] It is best to plant a cover crop after the row crop and to include 2 years of sod for each 4 years of row crops in the rotation; avoid overdraining.

Bonaparte, Gloucester, and Hinckley soils. The less fertile soils require fertilizer, particularly potash, to grow conifers for Christmas trees as well as for trees planted for forest to make rapid growth. In eroded areas or in places where the substratum consists only of coarse sand or gravelly sand, jack and Scotch pine grow best.

MANAGEMENT GROUP 25

Moderately well drained, nearly level or undulating, very sandy soils.

The soils in this group are nearly level to undulating and are very sandy. They are moderately well drained. The soils are low in plant nutrients. In both, the horizon just below or partly in the plow layer contains iron, and in places that horizon is cemented. In these soils the subsoil is seasonally wet because in spring the water table is within 18 inches of the surface. The water table drops in midsummer to depths of 6 to more than 8 feet. The soils are subject to wind erosion. Yields are only fair, even when large amounts of lime and fertilizer are added. Under normal management yields are low.

The soils in this group are listed in table 25 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group are low in nitrogen. They are medium to low in phosphorus and are very low in ability to supply potassium. Some of the minor plant nutrients are lacking. The iron in the plow layer or in the horizon just below the plow layer can fix large amounts of phosphorus. When phosphate is added, it is best to place it on the soils rather than to mix it into the soils. The soils need testing to determine the specific amounts of phosphate and potash required.

Lime needs.—These soils are acid throughout the rooting zone. They need to be tested to determine the specific amounts of lime they require.

Suitability for crops and pastures.—The soils in this group are best suited to crops that will tolerate moderate wetness early in spring and dryness in midsummer. Yields are poor; therefore, it is generally best to plant crops that are not costly to produce. Corn, small grains, and hay are the crops most commonly grown, but potatoes grow well when moisture conditions are favorable. Management is needed to maintain good structure and the content of organic matter, as well as to prevent the soils from blowing.

These soils are best suited to deep-rooted pasture plants that tolerate seasonal wetness. Normally, native pastures are very poor, and they are hard to improve. Rotation pastures yield well in spring and early in summer but generally produce poor forage in summer and fall.

Suitability for planting trees.—These soils are best suited to white and Scotch pine and to European and Japanese larch. In most areas fertilizer is needed for trees to make satisfactory early growth.

Class IV

Soils that are suited to pasture or trees but if tilled are suitable for only limited or occasional cultivation and with very severe limitations.

Subclass IVe.—Soils that have very severe risk of erosion.

MANAGEMENT GROUP 26

Well-drained, steep soils.

In this group are deep, well-drained soils that are medium to high in lime. The soils are high in ability to hold available moisture. Because of their steep slopes, they are difficult to till. Runoff is rapid, and the hazard of erosion is high. Although these soils are among the most fertile of the county, it is best to restrict their use.

The soils in this group are listed in table 26 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils of this group have a moderate supply of nitrogen, phosphorus, and potassium. The supply of potassium in Howard and Kars soils, 15 to 35 percent slopes, is slightly lower than in the other soils of the group. It is best to test the soils to determine the specific amounts of potash needed.

Lime needs.—The Herkimer, Kars, Mohawk, and Nellis soils normally need no lime, but in places the surface layer

TABLE 26.—*Soils of management group 26, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Herkimer silt loam, 15 to 25 percent slopes	Medium.	High.	5. 0	3. 5–4. 0	4. 5–5. 0	5. 0–5. 5
Howard and Kars soils, 15 to 35 percent slopes	Medium.	Medium to high.	5. 5	2. 0–2. 5	2. 5–3. 0	3. 0–3. 5
Mohawk silt loam, 15 to 25 percent slopes	Medium.	High.	6. 0	----------	1. 0–1. 5	1. 5–2. 0
Nellis loam, moderately deep and deep, 15 to 25 percent slopes.	Medium.	High.				
Poland silt loam, 15 to 25 percent slopes	Medium.	Medium.				

Cropping systems [2]	Supporting practices [3]
R–C–S–S–S–S	Contour cultivation; plow in strips.
C–S–S–S–S	Cross-slope cultivation; plow in strips.
S–S–S–S	Not needed.

[1] For definitions, see section, Some Steps to Good Management.
[2] R=row or intertilled crop; C=close-growing crop; S=sod-forming crop.
[3] Avoid the use of row crops; do not plow under sod crops until the legumes fail; then reestablish the sod in strips.

of these soils is acid. The Howard and Poland soils have an acid surface layer, and free lime occurs in the substratum. All of the soils need to be tested to determine the specific amounts of lime they require.

Suitability for crops and pastures.—Generally, it is best not to use these soils for row crops. If they must be used for that purpose, corn is one of the best crops to plant. The soils are suited to wheat and oats. Any of the mixtures used to seed similar soils can be used for seeding forage crops. The soils are particularly well suited to alfalfa, but any of the deep-rooted perennial legumes can be grown.

On many farms it is best to use these soils for pasture rather than for tilled crops. Rotation pastures are better than improved native pastures, but native pastures can be made productive, especially for spring and early summer grazing. It is best to use seeding mixtures that consist largely of deep-rooted legumes.

Suitability for planting trees.—These soils are well suited to trees, but the kind of tree that is best to plant depends upon the degree to which the surface layer is alkaline. In eroded areas, the depth to bedrock is less than in uneroded areas and the surface layer is more alkaline. Areas in which the pH of the surface layer is less than 6.0 are suited to pine, spruce, larch, and Douglas-fir grown for use as Christmas trees. If the surface layer is neutral to mildly alkaline in reaction, it is best not to plant red pine and most other conifers because these trees are susceptible to root rot when they become older.

If there is free lime in the surface layer, Austrian pine, European larch, and whitecedar are the best conifers to plant. Black locust, hybrid poplar, and other hardwoods can be grown on all of the soils. Poplar and other hardwoods, and spruce, balsam, and Japanese larch should not be planted on soils that are less than 30 inches deep over bedrock. On steep, gravelly soils that slope toward the south and west, spruce and balsam may grow slowly and have a poor rate of survival.

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MANAGEMENT GROUP 27

Well-drained to somewhat excessively drained soils.

The soils in this group are deep and somewhat sandy. They are well drained to excessively drained. The steep slopes make the soils difficult to till. Runoff is rapid and causes severe erosion. The soils are all moderate in their ability to hold available moisture. The supply of plant nutrients is slightly lower than moderate. The soils need management to control runoff and to maintain organic matter.

The soils in this group are listed in table 27 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group are medium to low in nitrogen. They have a moderate supply of phosphorus but are low in ability to supply potassium. Under poor management the supply of nitrogen and potash in the soils deteriorates. It is best to test the soils to determine the specific amounts of nitrogen and potash they require.

Lime needs.—The rooting zone of the Colonie soil is acid throughout. The uppermost two layers of the Petoskey soil are neutral to medium acid, but the lower layers are neutral or calcareous. Although the Petoskey soil commonly needs no lime, both soils should be tested to determine whether lime is needed and the specific amounts required.

Suitability for crops and pastures.—Because these moderately droughty soils give a somewhat limited response to treatment, they are not well suited to crops that are expensive to grow. They are better suited to corn than to other row crops. Of the close-growing crops, they are best suited to wheat and oats. Alfalfa and other deep-rooted legumes are desirable as sod-forming crops.

Typically, pastures on these soils make medium to good yields in spring. The yields are low to medium in summer and become lower when the soils dry out. The

TABLE 27.—*Soils of management group 27, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Colonie fine sandy loam, 15 to 35 percent slopes	Low.	Low.	5.0	2.0–2.5	2.5–3.0	3.0–3.5
Petoskey fine sandy loam, 15 to 25 percent slopes	Low.	High.	5.5	1.0–1.5	1.5–2.0	2.0–2.5
			6.0	----------	1.0–1.5	1.0–1.5

Cropping systems [2]	Supporting practices [3]
R–C–S–S–S–S	Contour cultivation; plow in strips.
C–S–S–S–S	Cross-slope cultivation; plow in strips.
S–S–S–S	Not needed.

[1] For definitions, see section, Some Steps to Good Management.
[2] R=row or intertilled crop; C=close-growing crop; S=sod-forming crop.
[3] Avoid the use of row crops; keep in sod until legumes fail; then reestablish the sod in strips.

soils are best suited to deep-rooted pasture plants. Although native pastures can be improved and will be productive, rotation pastures give the best yields on these soils.

Suitability for planting trees.—These soils are suited to all of the conifers commonly planted in the county. The more fertile areas are suited to black locust, hybrid poplar, and other hardwoods commonly grown in the county. It is best not to plant red pine on the few areas of the Petoskey soil that have a neutral or alkaline surface layer, but Austrian pine normally will grow well.

MANAGEMENT GROUP 28

Well drained to moderately well drained, acid, steep soils.

In this group are deep, well drained to moderately well drained, acid, steep soils. The soils are all moderate in available moisture-holding capacity and are low in plant nutrients. Except for the Gloucester soil, they all have pans at depths below about 24 inches, and these pans restrict rooting. The steep slopes cause water to be lost through runoff and the erosion hazard to be high. They also make tillage difficult.

The soils in this group are listed in table 28 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group are low in nitrogen but have a moderate supply of phosphorus. The Camroden and Pinckney soils have a medium ability to supply potassium, but the others are low in ability. If the soils are limed heavily, the need for phosphate may decrease and the need for potash may increase. The soils need

TABLE 28.—*Soils of management group 28, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach— [2]		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Camroden silt loam, 15 to 25 percent slopes	Medium.	Low.	5.0	2.5–3.0	3.5–4.0	4.0–4.5
Essex stony fine sandy loam, 15 to 25 percent slopes	Low.	Low.	5.5	1.5–2.0	2.0–2.5	2.5–3.0
Gloucester stony sandy loam, 15 to 25 percent slopes	Low.	Low.	6.9	----------	1.0–1.5	1.5–2.0
Pinckney silt loam, 15 to 25 percent slopes	Medium.	Low.				
Worth stony loam, 15 to 25 percent slopes	Low.	Low.				

Cropping systems [3]	Supporting practices [4]
R–C–S–S–S–S	Use contour or cross-slope cultivation; plow and reseed in strips; on long slopes use diversion terraces.
C–S–S–S–S	Same.
S–S–S–S	Not needed.

[1] For definitions, see section, Some Steps to Good Management.
[2] Increase amounts by about 25 percent for the Camroden and Pinckney soils.
[3] R=row or intertilled crop; C=close-growing crop; S=sod-forming crop.
[4] Avoid use of row crops; keep in sod crops most of the time.

TABLE 29.—*Soils of management group 29, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Hartland very fine sandy loam, 12 to 20 percent slopes	Low.	Low.	5.0	3.0–3.5	4.0–4.5	4.5–5.0
			5.5	1.5–2.0	2.0–2.5	2.5–3.0
			6.0		1.0–1.5	1.5–2.0

Cropping systems [2]	Supporting practices [3]
C–S–S–S–S	Cross-slope cultivation; plow and reseed in strips.
S–S–S–S	Not needed.

[1] For definitions, see section, Some Steps to Good Management.
[2] C=close-growing crop; S=sod-forming crop.
[3] Avoid use of row crops, but if it is essential to grow them, plant them in narrow strips and follow with a close-growing crop; keep in sod as long as feasible or until legumes fail.

testing to determine the specific amounts of phosphate and potash they require.

Lime needs.—These soils are acid throughout the rooting zone. They initially require about the amounts of lime suggested for a soil test of pH 5.0 After the initial application, the soils need to be tested to determine the specific amounts of lime they require.

Suitability for crops and pastures.—The response of these soils to management is somewhat limited; therefore, it is best to plant crops that are not expensive to grow. These soils are best suited to close-growing and sod-forming crops. Of the row crops, the soils are probably best suited to corn, and, of the close-growing crops, they are best suited to wheat and oats. Birdsfoot trefoil and other deep-rooted legumes that are drought resistant and tolerate low fertility are the best to use in mixtures seeded for hay. Because of restricted drainage, the Camroden soil is best suited to shallow-rooted legumes. If adequate lime and fertilizer are added, alfalfa can be used in the seeding mixtures on all of the soils of the group.

Rotation pastures are best for these soils. Yields of native pastures are low, even when the pastures are improved. Generally, deep-rooted pasture plants grow best on these soils, but shallow-rooted plants normally make good yields in spring and early in summer. The rate of runoff on these slopes is such that pasture yields generally are low in dry weather.

Suitability for planting trees.—These soils are suited to white and Scotch pine, white and Norway spruce, and European and Japanese larch. Balsam fir can be grown for Christmas trees. All but the Camroden soil are suited to red pine.

MANAGEMENT GROUP 29

Well-drained, acid, highly erodible soil.

Only one soil is in this group. It is deep, well drained, and acid and is highly erodible. This soil is moderately high in available moisture-holding capacity, but it is moderately low in plant nutrients. If the content of organic matter is not maintained, a surface crust tends to form on the soil.

Table 29 lists the name of this soil along with facts about its ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—This soil has a moderate supply of nitrogen and phosphorus, but it is low in ability to supply potassium. It should be tested to determine the specific amounts of these elements needed.

Lime needs.—This acid soil needs to be tested to determine the specific amounts of lime it requires.

Suitability for crops and pastures.—This soil is best used for close-growing or sod-forming crops. It is suited to wheat and oats and to deep-rooted, perennial legumes, although shallow-rooted ones can be grown. It is best to use legumes in seeding mixtures that will remain in the stand for long periods.

Although native pastures can be improved by adding lime and fertilizer, it is better to use long-term rotation pastures on this soil. The rotation pastures produce better yields and are better for control of erosion. The deep-rooted legumes generally make the best yields in midsummer, and the shallow-rooted legumes, in spring. Adequate lime and fertilizer are necessary for good yields on all kinds of pasture.

Suitability for planting trees.—This soil is suited to white, red, and Scotch pine, European and Japanese larch, and white and Norway spruce.

Subclass IVw.—Soils that have very severe limitations because of excess water.

MANAGEMENT GROUP 30

Poorly drained to very poorly drained soils with a moderately fine textured subsoil.

The soils in this group are poorly drained to very poorly drained. They have a moderately fine textured subsoil. All of these soils are high in available moisture-holding capacity. Glenfield silt loam, neutral, 0 to 5 percent slopes, and the Ilion, Madalin, and Marcy soils have a good natural supply of plant nutrients, but the supply in the other soils is only moderate. All of the soils are wet, and it is difficult to establish artificial drainage on them.

TABLE 30.—*Soils of management group 30, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Gage silt loam, 0 to 3 percent slopes	Medium.	Low.	5. 0	4. 0–4. 5	5. 0–5. 5	5. 5–6. 0
Glenfield silt loam, neutral, 0 to 5 percent slopes	High.	High.	5. 5	2. 5–3. 0	3. 0–3. 5	3. 5–4. 0
Glenfield silt loam, acid, 0 to 3 percent slopes	High.	Low.	6. 0		1. 0–1. 5	1. 5–2. 0
Ilion silt loam, 0 to 3 percent slopes	High.	High.				
Madalin silt loam, 0 to 2 percent slopes	High.	Medium.				
Marcy silt loam, 0 to 3 percent slopes	High.	Medium.				
Scantic silty clay loam, 0 to 3 percent slopes	High.	Low.				

Cropping systems [2]	Supporting practices [3]
R–C–S–S–S–S; C–S–S–S–S; S–S–S–S–S	Use open ditches or bedding for all cropping systems.

[1] For definitions, see section, Some Steps to Good Management.
[2] R=row or intertilled crop; C=close-growing crop; S=sod-forming crop.
[3] In areas where permeability is better than normal, artificial drainage may improve the soil enough so that shorter rotations that include fewer sod-forming crops and more row crops or close-growing crops can be used; the restricted cropping systems suggested are based on limitations for row crops and small grains, not on risk of damage to the soil.

The soils in this group are listed in table 30 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group are high in nitrogen, but they are slow to release it. They have a moderate supply of phosphorus. Except for the Gage soil, which is medium, these soils are high in ability to supply potassium. The soils need to be tested to determine the specific amounts of phosphate and potash they require.

Lime needs.—The Gage soil, Glenfield silt loam, acid, 0 to 3 percent slopes, and the Scantic soil are all acid throughout the rooting zone. The Ilion soil and Glenfield silt loam, neutral, 0 to 5 percent slopes, are neutral throughout and normally need no lime. The Madalin and Marcy soils have an acid plow layer. They are neutral at relatively shallow depths but, in some places, not within reach of plant roots. The soils need testing to determine the specific amounts of lime required.

Suitability for crops and pastures.—The use of these soils for crops is limited by wetness. If drainage is improved by using ditches or bedding, corn and small grains can be grown. If it is improved mainly by using dead furrows, road ditches, and occasional field ditches, most crops fail or make very low yields. Sod crops that are water tolerant are best in these places. Clover and other shallow-rooted perennial legumes yield well on areas where a moderate degree of drainage has been established. On undrained meadows, grasses are about the only crop plants that will survive.

If drainage is improved enough to permit ladino clover and similar plants to become established, these soils are among the best in the county for midsummer grazing. The yields on undrained native pastures are medium to low. For seeding, it is best to use a mixture consisting mainly of water-tolerant plants.

Suitability for planting trees.—The use of these soils for trees depends upon drainage and upon whether the surface layer is alkaline. Generally, the soils are best suited to white and Norway spruce, although these trees are subject to root rot when they become older if they are planted on soils that are neutral or alkaline. Scotch pine and balsam may be grown for Christmas trees on the somewhat better drained areas. The wet soils that are high in lime are suited only to whitecedar.

MANAGEMENT GROUP 31

Nearly level, poorly drained to somewhat poorly drained soils on flood plains.

The soils in this group are nearly level and are poorly drained to somewhat poorly drained. They are high in moisture-supplying capacity. These soils are among the more fertile soils of the county, but they occur on first bottoms and are subject to severe flooding. They are so wet that it is not feasible to use them for crops. In most places it is difficult to provide adequate drainage; consequently, yields of most crops are low.

The soils in the group are listed in table 31 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—Although these soils are high in nitrogen, they release it slowly until July. In general, they have a moderate supply of phosphorus and potassium, but the Rumney soil has a slightly lower than moderate supply of potassium. The soils need testing to determine the specific amounts of potash required.

Lime needs.—Except in a few places, the Wayland soil is neutral throughout and normally needs no lime. The Rumney soil is medium acid to very strongly acid. It is best to test the soils to determine their specific requirements for lime.

Suitability for crops and pastures.—In most places drainage of these soils has been somewhat improved through the use of occasional field ditches and dead furrows. These areas are best suited to water-tolerant sod crops. If a mixture of grasses and shallow-rooted

TABLE 31.—*Soils of management group 31, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach— pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Rumney silt loam, 0 to 2 percent slopes	Medium.	Low.	5. 0	4. 0–4. 5	5. 0–5. 5	5. 5–6. 0
Wayland silt loam, 0 to 2 percent slopes	Medium.	High.	5. 5	2. 5–3. 0	3. 0–3. 5	3. 5–4. 0
			6. 0	----------	1. 0–1. 5	1. 5–2. 0

Cropping systems [2]	Supporting practices [3]
C–S–S–S–S; S–S–S–S	Use open ditches to remove surface water; divert water from adjacent uplands.

[1] For definitions, see section, Some Steps to Good Management.
[2] C=close-growing crop; S=sod-forming crop.
[3] Where it is feasible to attain better than normal drainage, a row crop can be used before the close-growing crop in the first rotation and the sod crop can be used for a shorter period. The cropping systems suggested are based on limitations for row crops and small grains, not on risk of damage to the soil.

legumes is used for seeding, good yields will be obtained. Where adequate drainage has been established, corn and small grains can be grown. Here, there is some risk of damage from flooding as well as lowering of yields of small grains because of lodging or late planting. Only a few areas can be drained enough so that row crops or small grains will make good yields.

If the soils are pastured when wet, there is risk of damage from trampling. In summer, however, when yields of most pastures are low, yields of pastures on these soils are high. Ladino clover and other shallow-rooted legumes grow better than deep-rooted ones. If adequate lime and fertilizer are added, native pastures make good yields.

Suitability for planting trees.—Frequent and prolonged flooding causes these soils to be unsuited to trees. Of the conifers, spruces grow best on the acid to neutral soils, but whitecedar grows best on soils that have a neutral to alkaline surface layer. It is best to plant willow and poplar on areas where cover is needed.

MANAGEMENT GROUP 32

Poorly drained to somewhat poorly drained soils in which bedrock occurs at depths of 10 to 30 inches.

The soils of this group are poorly drained to somewhat poorly drained. Normally, they are too wet for many crops in the spring, and they are wet periodically throughout the growing season. They have a limited capacity for storing water and may become very dry during periods of prolonged drought. Bedrock is at depths of about 24 inches or less and prevents draining the soils adequately.

The soils in this group are listed in table 32 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

TABLE 32.—*Soils of management group 32, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach— [2] pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Gage silt loam, shallow, 0 to 8 percent slopes	Medium.	Low.	5. 0	4. 0–4. 5	5. 0–5. 5	5. 5–6. 0
Kendaia silt loam, shallow, 0 to 3 percent slopes	Medium.	High.	5. 5	2. 5–3. 0	3. 0–3. 5	3. 5–4. 0
Kendaia silt loam, shallow, 3 to 8 percent slopes	Medium.	High.	6. 0	----------	1. 0–1. 5	1. 5–2. 0

Cropping systems [3]	Supporting practices [4]
R–C–S–S–S–S	If the soil is deep enough, use ditches or furrows to drain low spots; if slopes are more than 3 percent, plow in strips.
C–S–S–S–S–S	Same.
S–S–S–S	Not needed.

[1] For definitions, see section, Some Steps to Good Management.
[2] If the Kendaia soils need lime, use about ½ ton less than indicated.
[3] R=row or intertilled crop; C=close-growing crop; S=sod-forming crop.
[4] The cropping systems suggested take into account the poor suitability of the soils for row crops and small grains.

Fertility.—The soils in this group are high in nitrogen, but they are slow to release it in spring. They have a moderate supply of phosphorus and potassium. It is best to test the soils to determine the specific amounts of phosphate and potash they require.

Lime needs.—The Gage soil is acid throughout and needs lime. The Kendaia soils are nearly neutral and generally need no lime; nevertheless, in some areas the surface layer is medium acid. The soils should be tested to determine the specific amounts of lime required.

Suitability for crops and pastures.—These soils are suited mainly to sod crops grown for hay and pasture. The shallow-rooted or water-tolerant plants are best. Generally, oats must be planted late, and as a result yields are lowered. Winter wheat is subject to damage from icing in winter, and much of it is winterkilled. Corn and other row crops can be grown in some years, but these crops are subject to damage from water in wet years.

If adequate amounts of lime and fertilizer are applied, native pastures produce high yields in spring and in summers of normal rainfall. Rotation pastures, however, make somewhat better yields. Pastures should be seeded to mixtures that tolerate wetness.

Suitability for planting trees.—The Gage soil is best suited to white and Norway spruce and to balsam fir. The Kendaia soils are best suited to whitecedar and white spruce. On the somewhat better drained areas, where the surface layer is acid to neutral, Scotch pine can be grown for cover or for use as Christmas trees. Where the surface layer is neutral to alkaline, Austrian pine can be grown for similar uses. It is best not to plant spruce or balsam fir in areas that tend to become dry.

MANAGEMENT GROUP 33

Very poorly drained soils.

The soils in this group are medium textured to moderately fine textured and are very poorly drained. They are all high in moisture-supplying capacity. Unless artificial drainage is supplied, they are too wet for crops or pastures. These soils are among the more fertile soils of the county if they are drained. Within the group, the Lyons soil is the most easily drained, and some areas of this soil make good cropland.

The soils in the group are listed in table 33 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—The soils in this group are high in nitrogen, but in spring or when they are wet they release it slowly. Their supply of phosphorus is medium. Except for the Lyons soil, which has only a moderate supply, they are high in potassium. It is best to test the soils to determine their specific requirements for these elements.

Lime needs.—The Fonda, Lyons, and Westland soils are nearly neutral and need no lime. In places the Alden and Biddeford soils need no lime, but normally their upper layers are medium acid to strongly acid. Tests are needed to determine the specific amounts required.

Suitability for crops and pastures.—These soils are not suited to crops unless they are drained. If they are partly drained through the use of ditches, tile drains, or bedding, they are well suited to water-tolerant hay crops. If they are drained adequately through the use of ditches or tile drains, cropping systems that include more row crops than close-growing or sod-forming crops can be used. The Lyons soil is the most easily drained of the soils in this group. If it is drained, it is among the best soils in the county for corn and most vegetable crops, as well as for hay and small grains. In most places the other soils of the group are difficult to drain and the cost of draining them is prohibitive. It is not feasible to use tile drainage on the Biddeford soil.

Sedges, reeds, and other undesirable plants grow on these soils if the areas are left undrained. The drainage normally supplied through clearing the soils and constructing roads and road ditches, or through using an occasional drainage ditch, may improve these areas enough so that some of them can be pastured during the drier seasons. On areas where ditch or tile drainage is installed

TABLE 33.—*Soils of management group 33, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—[2]		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Alden silt loam, 0 to 3 percent slopes	High.	Medium.				
Biddeford silty clay loam, 0 to 2 percent slopes	High.	Medium.	5. 0	4. 5–5. 0	5. 5–6. 0	6. 5–7. 0
Fonda silt loam, 0 to 3 percent slopes	High.	High.	5. 5	3. 0–3. 5	4. 0–4. 5	4. 5–5. 0
Lyons silt loam, 0 to 3 percent slopes	Medium.	High.	6. 0	----------	1. 5–2. 0	2. 0–2. 5
Westland silt loam, 0 to 2 percent slopes	High.	High.				

Cropping systems [3]	Supporting practices [4]
C–S–S–S–S; S–S–S–S	Open ditch or tile drainage.

[1] For definitions, see section, Some Steps to Good Management.
[2] Few areas are as acid as pH 5.0.
[3] C=close-growing crop; S=sod-forming crop.
[4] Where it is feasible to attain better than normal artificial drainage, row crops can be used in the rotation. The cropping systems suggested are based on limitations for row crops and small grains, not on risk of damage to the soil.

TABLE 34.—*Soils of management group 34, their ability to supply lime and potassium, lime needed at different pH values, cropping systems, and practices* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Amenia loam, shallow, 2 to 8 percent slopes	Medium.	High.	5. 0	3. 5–4. 0	4. 5–5. 0	5. 0–5. 5
Manlius silt loam, 0 to 8 percent slopes	Medium.	Low.	5. 5	2. 0–2. 5	2. 5–3. 0	3. 0–3. 5
Manlius silt loam, 8 to 15 percent slopes	Medium.	Low.	6. 0	----------	1. 0–1. 5	1. 5–2. 0
Nellis loam, shallow, 0 to 8 percent slopes	Medium.	High.				
Nellis loam, shallow, 8 to 15 percent slopes	Medium.	High.				

Cropping systems [2]	Supporting practices
R–C–S–S–S–S	On all slopes greater than 3 percent, seed in strips across the slope.
C–S–S–S–S	On all slopes greater than 3 percent, seed in strips across the slope.
S–S–S–S	Not needed.

[1] For definitions, see section, Some Steps to Good Management.

[2] R=row or intertilled crop; C=close-growing crop; S=sod-forming crop.

systematically, pastures make high yields and maintain those yields even in dry seasons. The best seeding mixture to use is one that contains ladino clover or similar legumes.

Suitability for planting trees.—Because of surface wetness and the heavy growth of other vegetation, these soils are difficult to reforest. Whitecedar is the best kind of tree to plant, but white and Norway spruce and balsam fir can be planted on unplowed, hummocky areas.

Subclass IVs.—Soils that have very severe limitations of unfavorable depth or texture.

MANAGEMENT GROUP 34

Gently sloping and sloping, shallow soils.

The soils of this group are medium textured and are well drained to moderately well drained. They occupy gently sloping to sloping areas. These soils are limited in use because they are only 24 to 30 inches deep over bedrock. They are subject to drought during dry periods, and structures to control runoff cannot be used on them. The Amenia and Nellis are among the more fertile soils of the county, but the Manlius soils are moderate to low in fertility.

The soils in this group are listed in table 34 along with facts about their ability to supply lime and potassium. Also listed are suitable cropping systems and supporting practices.

Fertility.—These soils have a moderate supply of nitrogen, phosphorus, and potassium. Generally, they need about the same amount of fertilizer as suggested for soils of average fertility. When lime is added to the Manlius soils, however, the need for potash may increase. It is best to test the soils to determine their specific needs for potash.

Lime needs.—In most places the Amenia and Nellis soils need little or no lime because they are nearly neutral, but in some places they are medium acid. The Manlius soils are acid throughout. All of the soils should be tested periodically to determine their specific requirements for lime.

Suitability for crops and pastures.—The response of these soils to management is low; therefore, it is best not to plant crops that are costly to grow. In rotations, corn can be used as the row crop and either wheat or oats as the close-growing crop. Hay crops that are drought resistant are the best to use for seeding. Yields of all of these crops are generally medium in years of favorable rainfall, but they are lower in dry years.

If the pastures are improved and if rainfall is high, yields of native pasture are fair to medium in the spring and in midsummer. In most years yields are low on both native and rotation pastures from mid-July to September. The best pasture yields are made when drought-resistant mixtures are seeded after the areas are plowed. Birdsfoot trefoil is among the best yielding plants, and it persists longer than other pasture plants on these soils.

Suitability for planting trees.—In places where the Amenia and Nellis soils contain lime, European larch, whitecedar, and Austrian pine grow well. Where the surface layer of these soils is acid or neutral, Scotch pine can be grown for Christmas trees. The Manlius soils, which are acid, are suited to white, red, and Scotch pine and to European larch. Nevertheless, trees grow slowly on the soils of this group because the depth to bedrock is shallow.

Class VI

Soils that have moderate limitations for pasture plants or trees but are not suited to tilled crops except under careful management.

Subclass VIe.—Soils moderately limited for pasture plants or trees because of risk of erosion.

MANAGEMENT GROUP 35

Steep or very steep soils of moderate to high fertility.

The soils in this group are moderate to high in fertility and in available moisture-holding capacity. They are steep to very steep. Because of the slopes, it is difficult, or impossible to use modern farm machinery for tillage. The soils are droughty in midsummer. The rapid runoff

TABLE 35.—*Soils of management group 35, their ability to supply lime and potassium, and lime needed at different pH values* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Nellis loam, 25 to 35 percent slopes	Medium.	High.	5. 0	3. 5–4. 0	4. 5–5. 0	5. 0–5. 5
Petoskey and Hartland fine sandy loams, 25 to 35 percent slopes.	High to medium.	High to low.	5. 5	2. 0–2. 5	2. 5–3. 0	3. 0–3. 5
Pinckney silt loam, 25 to 35 percent slopes	Medium.	Low.	6. 0	----------	1. 0–1. 5	1. 5–2. 0
Pinckney silt loam, 15 to 35 percent slopes, eroded	Medium.	Low.				
Poland and Mohawk silt loams, 25 to 35 percent slopes	Medium.	High to medium.				

[1] For definitions, see section, Some Steps to Good Management.

causes erosion as well as loss of water. The Nellis, Mohawk, and Poland soils are among the more fertile soils in the county; the Hartland, Petoskey, and Pinckney are moderate in fertility.

The soils in this group are listed in table 35 along with facts about their ability to supply lime and potassium.

Fertility.—Except for Pinckney silt loam, 15 to 35 percent slopes, eroded, which is low in nitrogen, the soils have a moderate supply of nitrogen. They all have a moderate supply of phosphorus. All of the soils are medium in potassium, except the Petoskey and Hartland fine sandy loams, 25 to 35 percent slopes, which are low in that element. Because of the slopes it is difficult to apply fertilizer on these soils. In many places it may not be feasible.

Lime needs.—The acid soils of this group need lime, but it is difficult to apply it. The Nellis soil normally needs no lime, but the Pinckney soils need initial applications in amounts suggested for a soil test of pH 5.0. It is best to test the soils to determine their specific requirements for lime.

Suitability for crops and pastures.—These soils are not suited to crops. It is difficult to grow crops; furthermore, they contribute to erosion if the soils are left bare after harvest, and yields are generally low. It is best to leave the soils in sod.

On the Mohawk-Poland and the Nellis soils, grazing is fair on unimproved native pastures in spring, but normally it is low in summer and fall. On the Hartland-Petoskey and the Pinckney soils, grazing is poor even in spring. If lime and fertilizer are added, the pastures will improve somewhat. Generally, however, the grasses and legumes on such soils make low yields. If birdsfoot trefoil is planted on all of the soils and adequate lime and fertilizer are added, the quality and yield of the pastures are much improved. In many areas it is not feasible to improve the pastures, and some of the areas are best used for trees.

Suitability for planting trees.—The soils are best suited to Austrian pine, European larch, whitecedar, and black locust. Soils in which the surface layer has a reaction of not more than pH 6.0 are suited to red, white, and Scotch pine and to European larch. On such soils, white and Norway spruce and Japanese larch usually grow well on the predominantly east-facing slopes unless the soil is shallow. The steep south- and west-facing slopes, however, may be too dry for these trees. Douglas-fir can be planted for use as Christmas trees on any of these steep, well-drained, cool slopes.

Where the soils have a neutral or alkaline surface layer, it is best to plant Austrian pine, European larch, and whitecedar. On such soils, white spruce and Scotch pine generally can be grown for use as Christmas trees. Black locust generally grows well in areas where the rooting zone is neutral or alkaline.

Subclass VIw.—Soils moderately limited for pasture plants or trees because of excess water.

MANAGEMENT GROUP 36

Very poorly drained soils subject to frequent flooding.

The soils in this group are on nearly level first bottoms. They are subject to frequent flooding and are very poorly drained. The soils are too wet for cultivated crops, and only a few areas can be drained enough for such use. If excess surface water is removed, the soils can be pastured.

The soils in this group are listed in table 36 along with facts about their ability to supply lime and potassium.

Fertility.—The soils in this group are high in nitrogen, but they release it slowly. They are medium in their ability to supply phosphorus and potassium. It is best to test the soils to determine the specific amounts of fertilizer they require.

Lime needs.—The Sloan soil does not require lime, but on the other soils lime is needed to improve the pastures. If the soils can be drained enough to justify improving the pastures, tests should be made to determine the specific amounts of lime required.

Suitability for crops and pastures.—The soils in this group are not suited to crops. Normally, the vegetation consists mostly of sedges, reeds, and pasture grasses that provide low-quality forage. Plants that are more desirable for grazing grow on the better drained areas of Alluvial land. Drainage is such that lime and fertilizer are of little help in improving the pastures. Much low-quality forage is available, however, on these soils in the drier seasons. Where drainage can be improved through the use of open ditches, the use of the soils for pasture is justified because some areas will provide good grazing. Other areas are flooded so frequently that draining them would be impractical.

Suitability for planting trees.—Generally, these soils are not suited to forest. Whitecedar can be planted on the ones that are high in lime. Spruce and balsam fir can be planted on the better drained areas or on the hummocks that are characteristic of unplowed areas.

TABLE 36.—*Soils of management group 36, their ability to supply lime and potassium, and lime needed at different pH values* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Alluvial land	Variable.	Variable.	5. 0	4. 5–5. 0	5. 5–6. 0	6. 5–7. 0
Saco silt loam, 0 to 2 percent slopes	Medium.	Low.	5. 5	3. 0–3. 5	4. 0–4. 5	2. 0–2. 5
Sloan silt loam, 0 to 2 percent slopes	Medium.	High.	6. 0	----------	1. 5–2. 0	2. 0–2. 5
Wallkill silt loam, 0 to 2 percent slopes	Medium.	Low.				

[1] For definitions, see section, Some Steps to Good Management.

TABLE 37.—*Soils of management group 37, their ability to supply lime and potassium, and lime needed at different pH values* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Manlius silt loam, 15 to 35 percent slopes	Medium.	Low.	5. 0	3. 5–4. 0	4. 5–5. 0	5. 0–5. 5
Nellis loam, shallow, 15 to 25 percent slopes	Medium.	High.	5. 5	2. 0–2. 5	2. 5–3. 0	3. 0–3. 5
Nellis loam, ledgy, 3 to 15 percent slopes	Medium.	High.	6. 0	----------	1. 0–1. 5	1. 5–2. 0

[1] For definitions, see section, Some Steps to Good Management.

Subclass VIs.—Soils moderately limited for pasture plants or trees because of unfavorable depth, texture, or stoniness.

MANAGEMENT GROUP 37

Shallow or ledgy soils.

The soils in this group are so shallow or ledgy that it is impractical to cultivate them. They are all somewhat droughty. The Manlius soil overlies soft shale. The Nellis soils overlie hard limestone, and there are outcrops of limestone in Nellis loam, ledgy, 3 to 15 percent slopes.

The soils in this group are listed in table 37 along with facts about their ability to supply lime and potassium.

Fertility.—These soils are medium in nitrogen, phosphorus, and potassium. Before adding fertilizer, however, it is best to test the soils to determine the specific amounts of fertilizer they require.

Lime needs.—The Nellis soils are nearly neutral, and they normally need no lime. The Manlius soil is acid and should be tested to determine its specific requirement for lime.

Suitability for crops and pastures.—The soils in this group are very poorly suited to crops. Because of the rock outcrops, plants cannot grow in many places.

Native pastures on these soils are generally pastured without being renovated or improved. On the Nellis soils such pastures may make fair yields in the spring and in unusually wet seasons, but they make low yields in most summers. On the Manlius soil native pastures are made up mainly of low-quality pasture plants. If birdsfoot trefoil or similar plants are seeded and adequately limed and fertilized, the quality and quantity of pasture yields will improve.

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Suitability for planting trees.—The Manlius soil is best suited to Scotch pine, red pine, and European larch. The Nellis soil is best suited to Austrian pine.

MANAGEMENT GROUP 38

Gently sloping to sloping, very stony soils.

The soils in this group are gently sloping to sloping and are very stony. They are all moderate in available moisture-supplying capacity. The content of plant nutrients varies widely. Except for the Empeyville and Scituate soils, which are moderately well drained, the soils are well drained. The soils are too stony to be used for crops.

The soils in this group are listed in table 38 along with facts about their ability to supply lime and potassium.

Fertility.—The soils in this group are medium in nitrogen and phosphorus. Except for the Nellis soil, which is medium in potassium, they are low in that element. When applying fertilizer, use the amounts suggested for permanent pastures on soils of similar fertility. It is best to test the soils, however, to determine the specific amounts required.

Lime needs.—The Dover and Nellis soils normally need no lime. All of the others are acid and require it for good yields of pasture. In some places the stones make it difficult to apply lime, but it can be applied in most places.

Suitability for crops and pastures.—The soils in this group are too stony to be suited to crops. Because of the stones, pasture improvement is limited to practices that can be applied without plowing. On most areas the native pastures can be improved somewhat by adding lime and fertilizer. Most native pastures are made up

TABLE 38.—*Soils of management group 38, their ability to supply lime and potassium, and lime needed at different pH values* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—[2]		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Dover very stony loam, 3 to 15 percent slopes	Low.	High.	5.0	2.5–3.0	3.5–4.0	4.0–4.5
Empeyville very stony loam, 3 to 15 percent slopes	Low.	Low.	5.5	1.5–2.0	2.0–2.5	2.5–3.0
Gloucester and Essex very stony fine sandy loams, 3 to 15 percent slopes.	Low.	Low.	6.0	----------	1.0–1.5	1.5–2.0
Nellis very stony loam, 3 to 15 percent slopes	Medium.	High.				
Scituate very stony fine sandy loam, 3 to 15 percent slopes	Low.	Low.				
Worth very stony loam, 3 to 15 percent slopes	Low.	Low.				

[1] For definitions, see section, Some Steps to Good Management.
[2] Lime can be applied only on the surface of these stony soils, and it is best to apply at any one time only the amounts suggested for surface applications on permanent pastures.

mainly of undesirable plants, and it is difficult to establish plants that are more desirable. If birdsfoot trefoil and other similar desirable plants can be established without plowing or adding lime and fertilizer, good yields of pasture can be obtained. Yields on unimproved native pasture are normally poor in both quality and quantity.

Suitability for planting trees.—The Dover and Nellis soils are suited to Austrian pine, European larch, and black locust. White spruce and Scotch pine can be grown on these soils for use as Christmas trees. The other soils of the group generally are suited to white, red, and Scotch pine, European and Japanese larch, and white and Norway spruce. It is best to plant red pine, however, only on the best drained areas of the Scituate and Empeyville soils. The coarser textured soils of the group are best suited to pines or larches.

MANAGEMENT GROUP 39

Poorly drained or very poorly drained, stony or shallow soils.

The soils in this group are stony or shallow and are poorly drained to very poorly drained. They are high in moisture-supplying capacity, and in some places they are excessively moist. The content of plant nutrients ranges from low to high. The shallowness of the soils and the many stones hinder tillage and limit improvement of drainage.

The soils in this group are listed in table 39 along with facts about their ability to supply lime and potassium.

Fertility.—These soils are high in nitrogen, but the soil releases it slowly. They are all medium in phosphorus and potassium. When applying fertilizer, use amounts suggested for permanent pastures on soils of similar fertility. It is best to have the soils tested, however, to determine the specific amounts required.

Lime needs.—The Kendaia and Lyons soils need no lime for pastures. In contrast, the Tughill and Westbury soils are acid and require lime if pastures are to make even fair yields.

Suitability for crops and pastures.—The soils in this group are not suited to crops. Pasture improvement is limited to practices that can be applied without plowing. The Kendaia soil is fertile and is somewhat better drained than the other soils. Pastures on it yield well with little management. The Lyons soils are so wet and stony that it is difficult to improve them for pasture. In the drier seasons, the native grasses make moderately good yields on the Lyons soils, but if the Lyons soils are drained slightly, good yields can be obtained. The Tughill soils are generally so wet and stony that it is not feasible to improve them for pasture. They support little vegetation of value for forage. The Westbury soil is wet but can be pastured. It is low in plant nutrients, and as a rule only undesirable plants grow on it.

Suitability for planting trees.—Most of these soils are difficult to reforest. The Kendaia and Lyons soils are best suited to whitecedar. In many places the Tughill and Westbury soils have not been cultivated, and they retain a hummocky relief. On these hummocks and on

TABLE 39.—*Soils of management group 39, their ability to supply lime and potassium, and lime needed at different pH values* [1]

Soil	Ability to supply potassium	Ability to supply lime	If pH value of these soils by soil test is—	Lime needed to reach—		
				pH 6.0	pH 6.5	pH 7.0
				Tons	*Tons*	*Tons*
Kendaia very stony silt loam, 0 to 15 percent slopes	Medium.	High.	5.0	3.5–4.0	4.5–5.0	5.0–5.5
Lyons silt loam, shallow, 0 to 3 percent slopes	Medium.	High.	5.5	2.0–2.5	2.5–3.0	3.0–3.5
Lyons very stony silt loam, 0 to 3 percent slopes	Medium.	High.	6.0	----------	1.0–1.5	1.5–2.0
Tughill stony and very stony silt loams, 0 to 5 percent slopes.	Medium.	Low.				
Westbury very stony loam, 0 to 8 percent slopes	Medium.	Low.				

[1] For definitions, see section, Some Steps to Good Management.

other better drained parts of the Westbury soil, white pine, Norway and red spruce, and balsam fir can be planted. The other areas are suited only to red spruce and balsam.

Class VII

Soils severely limited for pasture plants or trees.

Subclass VIIw.—Soils severely limited for pasture plants or trees because of excess water.

MANAGEMENT GROUP 40

Wet peats and mucks.

The soils in this group are too wet for crops. Only a few areas can be drained enough to use as pasture. If they were drained, some areas of Peat and muck, deep, would be good cropland, but as yet no areas have been drained.

The soils in this group are listed in table 40 along with facts about their ability to supply lime and potassium.

TABLE 40.—*Soils of management group 40 and their ability to supply lime and potassium* [1]

Soil	Ability to supply potassium	Ability to supply lime
Peat and muck, deep	Very low.	Variable.
Peat and muck, shallow	Very low.	Variable.

[1] For a discussion of lime and potassium, see section, Some Steps to Good Management.

Suitability for planting trees.—These soils are seldom used for forest. The neutral or alkaline peats are suited to whitecedar. The neutral to acid peats that have been drained somewhat or that have a hummocky surface are suited to white, red, or Norway spruce, balsam fir, and white pine.

Subclass VIIs.—Soils severely limited for pasture plants or trees because of unfavorable texture or depth.

MANAGEMENT GROUP 41

Stony or shallow soils, rough broken land, or rockland.

The soils of this group are stony, shallow, and steep. They cannot be used for crops and are very poor for pasture. Within the group, Rockland and the shallow and ledgy soils are droughty, but the other soils have a high moisture-supplying capacity. Native pastures on these soils make poor yields, and it is difficult or impossible to improve them. Most areas are best suited to forests or to use for recreational purposes.

The soils in this group are listed in table 41 along with facts about their ability to supply lime and potassium.

Suitability for planting trees.—The suitability of the soils in this group for trees varies widely. If trees are to be grown for use as timber or for Christmas trees, it is best to plant them on areas that have more than 2 feet of soil over bedrock. Trees can be planted on shallower soils for other uses. The Dover and Nellis soils and Rockland, limestone, can be planted to Austrian pine and

TABLE 41.—*Soils of management group 41 and their ability to supply lime and potassium* [1]

[Dashes indicate no information available]

Soil	Ability to supply potassium	Ability to supply lime
Dover very stony loam, 15 to 35 percent slopes.	Low.	High.
Gloucester and Essex very stony fine sandy loams, 15 to 35 percent slopes.	Low.	Low.
Gloucester and Scituate soils, extremely stony, 3 to 35 percent slopes.	Low.	Low.
Gloucester very stony fine sandy loam, shallow, 5 to 25 percent slopes.	Low.	Low.
Nellis very stony loam, 15 to 35 percent slopes.	Medium.	High.
Nellis loam, ledgy, 15 to 35 percent slopes.	Medium.	High.
Rockland, gneiss	-----------	-----------
Rockland, limestone	-----------	-----------
Rough broken land	-----------	-----------
Worth very stony loam, 15 to 35 percent slopes.	Low.	Low.

[1] For a discussion of lime and potassium, see section, Some Steps to Good Management.

whitecedar for use as cover. European larch and Scotch pine can also be used as cover where the soils have a surface layer that is not calcareous. The Gloucester, Rockland, gneiss, and Worth soils that have no lime are suited to Scotch, jack, and red pine and to European larch.

MANAGEMENT GROUP 42

Sandy or gravelly, droughty soils.

The soils in this group are droughty and are sandy or gravelly. Except for the Bonaparte soil, they are generally very strongly or extremely acid. All of the soils are low in plant nutrients, and they may be deficient in minor nutrients. They are not productive either of crops or pasture. They are best suited to forestry, but trees planted on them may show a lack of minor nutrients.

The soils in this group are listed in table 42 along with facts about their ability to supply lime and potassium.

Suitability for planting trees.—Generally, these soils make poor sites for growing trees, but they need reforesting to help stabilize the soil. In places the Bonaparte soil has a nearly neutral to calcareous surface layer. Here, whitecedar, Austrian pine, European larch, and black locust can be planted. The other soils are more limited for trees because of steep west to southwest exposures and erosion. The less eroded areas can be planted to red pine and European larch, and jack and Scotch pine is best on the other areas. In many places fertilizer will help in establishing a forest cover.

It is useless to plant trees on active sandblows unless the soil is first stabilized. Likewise, such areas and areas of exposed subsoil are so low in plant nutrients that trees fail or grow very slowly. Here, special management practices would be required to establish trees.

TABLE 42.—*Soils in management group 42 and their ability to supply lime and potassium*[1]

Soil	Ability to supply potassium	Ability to supply lime
Adams loamy fine sand, 15 to 35 percent slopes.	Very low.	Low.
Adams loamy fine sand, 0 to 15 percent slopes, severely blown.	Very low.	Low.
Blownout land	Very low.	Low.
Bonaparte gravelly sandy loam, 15 to 45 percent slopes.	Very low.	High.
Colosse soils, 15 to 45 percent slopes	Very low.	Low.
Colton loamy sand and cobbly loamy sand, 15 to 25 percent slopes.	Very low.	Low.
Colton loamy sand and cobbly loamy sand, 25 to 45 percent slopes.	Very low.	Low.
Colton soils, 0 to 15 percent slopes, severely blown.	Very low.	Low.
Colton and Adams soils, 15 to 35 percent slopes, severely blown.	Very low.	Low.

[1] For a discussion of lime and potassium, see section, Some Steps to Good Management.

MANAGEMENT GROUP 43

Wet, extremely stony soils.

The soils in this group are wet and extremely stony. They are very acid and are moderately low in plant nutrients. The Ridgebury soils are poorly drained, and the Whitman are very poorly drained. These soils are not suited to crops and are very poor for pasture. It is not feasible to improve them for either use.

The soils in the group are listed in table 43 along with facts about their ability to supply lime and potassium.

Suitability for planting trees.—The soils in this group are too stony and wet for most trees to grow well. They are best suited to red spruce and balsam fir.

TABLE 43.—*Soils of management group 43 and their ability to supply lime and potassium*[1]

Soil	Ability to supply potassium	Ability to supply lime
Ridgebury soils, extremely stony, 0 to 8 percent slopes.	Low.	Low.
Whitman soils, extremely stony, 0 to 8 percent slopes.	Low.	Low.

[1] For a discussion of lime and potassium, see section, Some Steps to Good Management.

Class VIII

Soils not suitable for producing plants in commercial quantity

MANAGEMENT GROUP 44

Fresh water marsh and riverwash.

This group is made up of miscellaneous land types unsuited to crops, pasture, or forest. It consists of the following:

Fresh water marsh. Riverwash.

Fresh water marsh is marshland that lies near the shores of lakes. It is under water, but marsh vegetation grows on it. It is well suited to certain kinds of wildlife.

Riverwash is made up of sand and gravel bars along large streams. Little vegetation grows on these areas.

Estimated Yields

Table 44 gives the average long-term acre yields a farmer can expect from his soils under the two levels of liming and fertilization. To supplement table 44, two levels of fertilization for a 5-year dairy-farm rotation are given in table 45. Following is a discussion of the different levels of management and of the basis on which these estimates were made.

TABLE 44.—*Estimated long-term average acre yields of principal crops to be expected under two levels of management*

[See table 45 for amounts of lime, nitrogen, potassium, and phosphorus suggested for a 5-year dairy-farm rotation at A and B levels of fertilization and liming. See section, Management Groups, for tables showing ability of individual soils to supply lime and potassium; lime requirements; cropping systems; and practices.

[The terms "low," "medium," and "high," indicate relative year-to-year variations in yields caused mainly by differences in the amount of rain that has fallen during the growing season.

Absence of yield estimate indicates crop is not commonly grown on the soil specified]

Soil name	Corn silage		Oats		Clover-grass hay		Grass hay		Alfalfa-grass hay		Yield variability
	A	B	A	B	A	B	A	B	A	A	
	Tons	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	
Adams loamy fine sand, 0 to 3 percent slopes	4	8	20	30	1.0	1.5	0.6	1.2	0.8	1.5	High.
Adams loamy fine sand, 3 to 8 percent slopes	4	8	20	30	1.0	1.5	.6	1.2	.8	1.5	High.
Adams loamy fine sand, 8 to 15 percent slopes	4	8	18	25	.8	1.5	.6	1.2	.8	1.5	High.
Adams loamy fine sand, 15 to 35 percent slopes	------	------	------	------	------	------	------	------	------	------	
Adams loamy fine sand, 0 to 15 percent slopes, severely blown.	------	------	------	------	------	------	------	------	------	------	
Adams and Colton soils, morainic, 3 to 8 percent slopes.	4	8	20	30	1.0	1.5	.6	1.2	.8	1.5	High.
Adams and Colton soils, morainic, 8 to 15 percent slopes.	4	8	20	30	1.0	1.5	.6	1.2	.8	1.5	High.
Alden silt loam, 0 to 3 percent slopes	------	------	------	------	------	------	------	------	------	------	
Alluvial land	------	------	------	------	------	------	------	------	------	------	

TABLE 44.—*Estimated long-term average acre yields of principal crops to be expected under two levels of management*—Con.

Soil name	Corn silage		Oats		Clover-grass hay		Grass hay		Alfalfa-grass hay		Yield variability
	A	B	A	B	A	B	A	B	A	A	
	Tons	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	
Amenia loam, deep, 0 to 3 percent slopes	9	12	35	50	1.5	2.5	1.0	2.0	1.0	2.5	Low.
Amenia loam, deep, 3 to 8 percent slopes	9	12	35	50	1.5	2.5	1.0	2.0	1.0	2.5	Low.
Amenia loam, moderately deep, 0 to 3 percent slopes.	8	11	30	45	1.2	2.2	1.0	2.0	1.0	2.0	Medium.
Amenia loam, moderately deep, 3 to 8 percent slopes.	8	11	30	45	1.2	2.2	1.0	2.0	1.0	2.0	Medium.
Amenia loam, shallow, 2 to 8 percent slopes	5	7	25	35	1.0	1.5	.8	1.0			High.
Biddeford silty clay loam, 0 to 2 percent slopes											
Blownout land											
Bonaparte gravelly sandy loam, 2 to 8 percent slopes.	4	8	18	25	1.0	1.5	.8	1.2	1.2	2.5	High.
Bonaparte gravelly sandy loam, 8 to 15 percent slopes.	4	7	15	22	1.0	1.5	.8	1.2	1.0	2.0	High.
Bonaparte gravelly sandy loam, 15 to 45 percent slopes.					.8	1.2	.5	1.0	1.0	1.5	High.
Buxton silt loam, 0 to 2 percent slopes	8	11	35	50	1.5	2.5	1.0	2.0	1.0	1.5	Low.
Buxton silt loam, 2 to 6 percent slopes	8	11	35	50	1.5	2.5	1.0	2.0	1.0	1.5	Low.
Buxton very fine sandy loam, 0 to 6 percent slopes	6	10	30	45	1.5	2.3	1.0	2.0	1.0	1.5	Low.
Camroden silt loam, 0 to 3 percent slopes	7	9	25	35	1.0	1.8	.8	1.4			Medium.
Camroden silt loam, 3 to 8 percent slopes	7	9	25	35	1.0	1.8	.8	1.4			Medium.
Camroden silt loam, 8 to 15 percent slopes	6	8	20	30	1.0	1.8	.8	1.4			Medium.
Camroden silt loam, 15 to 25 percent slopes			15	22	1.0	1.5	.6	1.2			High.
Chagrin silt loam, 0 to 2 percent slopes	9	12	40	55	1.8	2.5	1.0	2.0	2.0	3.0	Low.
Colonie fine sandy loam, 0 to 3 percent slopes	8	11	35	50	1.2	2.8	1.0	2.0	1.5	3.0	Medium.
Colonie fine sandy loam, 3 to 8 percent slopes	8	11	35	50	1.2	2.8	1.0	2.0	1.5	3.0	Medium.
Colonie fine sandy loam, 8 to 15 percent slopes	7	10	30	45	1.0	2.5	1.0	1.8	1.5	2.8	Medium.
Colonie fine sandy loam, 15 to 35 percent slopes					1.0	1.3	.5	1.0	1.0	1.5	High.
Colosse gravelly fine sandy loam, 2 to 8 percent slopes.	6	8	25	30	1.0	1.5	.8	1.3	1.0	2.2	High.
Colosse cobbly loamy fine sand, 2 to 8 percent slopes.	5	7	20	25	1.0	1.5	.5	1.0	.8	1.5	High.
Colosse cobbly loamy fine sand, 8 to 15 percent slopes.	4	6	15	20	1.0	1.5	.5	1.0	.8	1.4	High.
Colosse soils, 15 to 45 percent slopes											
Colton loamy fine sand, 0 to 3 percent slopes	4	8	20	30	1.0	1.5	.6	1.2	.8	1.5	High.
Colton loamy fine sand, 3 to 8 percent slopes	4	8	20	30	1.0	1.5	.6	1.2	.8	1.5	High.
Colton loamy fine sand, 8 to 15 percent slopes	4	7	15	25	1.0	1.5	.6	1.2	.8	1.5	High.
Colton gravelly loamy sand, 0 to 8 percent slopes	4	8	20	30	1.0	1.5	.6	1.2	.8	1.5	High.
Colton gravelly loamy sand, 8 to 15 percent slopes	4	7	15	25	1.0	1.5	.6	1.2	.8	1.5	High.
Colton loamy sand and cobbly loamy sand, 15 to 25 percent slopes.					.6	1.2	.4	1.0	.6	1.2	High.
Colton loamy sand and cobbly loamy sand, 25 to 45 percent slopes.											
Colton soils, 0 to 15 percent slopes, severely blown											
Colton and Adams soils, 15 to 35 percent slopes, severely blown.											
Croghan loamy fine sand, 0 to 5 percent slopes	5	9	20	30	1.0	1.5	.7	1.4			Medium.
Dover stony loam, 3 to 8 percent slopes	6	9	25	40	1.5	2.0	1.0	1.5	1.5	2.5	Medium.
Dover stony loam, 8 to 15 percent slopes	6	8	20	35	1.5	2.0	1.0	1.5	1.5	2.5	Medium.
Dover very stony loam, 3 to 15 percent slopes											
Dover very stony loam, 15 to 35 percent slopes											
Duane sandy loam, 0 to 5 percent slopes	6	9	20	35	1.0	1.8	.6	1.5	.8	1.4	Medium.
Eel silt loam, 0 to 2 percent slopes	9	12	35	50	1.5	2.5	1.4	2.1	1.0	1.8	Low.
Elmwood sandy loam, 0 to 6 percent slopes	8	11	30	45	1.5	2.5	1.0	2.0	1.0	2.0	Low.
Empeyville stony loam, 3 to 8 percent slopes	6	8	22	35	1.2	2.0	.8	1.6	.8	1.8	Medium.
Empeyville stony loam, 8 to 15 percent slopes	5	7	20	30	1.2	2.0	.8	1.6	.8	1.8	Medium.
Empeyville very stony loam, 3 to 15 percent slopes											
Empeyville flaggy silt loam, 3 to 8 percent slopes	7	9	25	40	1.5	2.3	.9	2.1	.8	1.5	Medium.
Empeyville flaggy silt loam, 8 to 15 percent slopes	6	8	25	40	1.8	2.2	.9	2.1	.8	1.5	Medium.
Essex stony fine sandy loam, 3 to 8 percent slopes	6	9	25	40	1.0	2.0	1.0	1.8	1.0	2.0	Medium.
Essex stony fine sandy loam, 8 to 15 percent slopes	5	8	25	40	1.0	2.0	1.0	1.8	1.0	2.0	Medium.
Essex stony fine sandy loam, 15 to 25 percent slopes											
Fonda silt loam, 0 to 3 percent slopes											
Fresh water marsh											
Gage silt loam, 0 to 3 percent slopes	4	7	15	25	.8	1.2	.6	1.1			High.
Gage silt loam, 3 to 8 percent slopes	4	8	15	30	.8	1.5	.6	1.3			High.
Gage silt loam, shallow, 0 to 8 percent slopes	4	6	12	20	.5	1.0	.5	.8			High.
Galen fine sandy loam, 0 to 6 percent slopes	8	11	30	45	1.4	2.5	1.0	2.0	1.0	1.8	Medium.
Genesee silt loam, 0 to 2 percent slopes	9	12	40	55	1.5	2.5	1.0	2.2	2.0	3.0	Low.

TABLE 44.—*Estimated long-term average acre yields of principal crops to be expected under two levels of management*—Con.

Soil name	Corn silage		Oats		Clover-grass hay		Grass hay		Alfalfa-grass hay		Yield variability
	A	B	A	B	A	B	A	B	A	A	
	Tons	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	
Genesee silt loam, alluvial fans, 0 to 3 percent slopes.	9	12	40	55	1. 5	2. 5	1. 0	2. 2	2. 0	3. 0	Low.
Glenfield silt loam, neutral, 0 to 5 percent slopes	6	9	20	35	1. 0	2. 0	1. 0	2. 0	------	------	Medium.
Glenfield silt loam, acid, 0 to 3 percent slopes	6	9	20	35	. 8	2. 0	1. 0	2. 0	------	------	Medium.
Gloucester stony fine sandy loam, 3 to 8 percent slopes.	7	10	30	40	1. 0	2. 0	1. 0	1. 8	. 8	2. 0	Medium.
Gloucester stony fine sandy loam, 8 to 15 percent slopes.	6	9	25	35	1. 0	2. 0	1. 0	1. 8	. 8	2. 0	Medium.
Gloucester stony sandy loam, 3 to 8 percent slopes	6	9	25	35	1. 0	2. 0	1. 0	1. 8	. 8	2. 0	Medium.
Gloucester stony sandy loam, 8 to 15 percent slopes	5	8	20	35	1. 0	2. 0	. 9	1. 8	. 8	2. 0	Medium.
Gloucester stony sandy loam, 15 to 25 percent slopes.	------	------	------	------	. 8	1. 5	. 7	1. 2	. 7	1. 5	High.
Gloucester and Essex very stony fine sandy loams, 3 to 15 percent slopes.	------	------	------	------	------	------	------	------	------	------	
Gloucester and Essex very stony fine sandy loams, 15 to 35 percent slopes.	------	------	------	------	------	------	------	------	------	------	
Gloucester and Scituate soils, extremely stony, 3 to 35 percent slopes.	------	------	------	------	------	------	------	------	------	------	
Gloucester very stony fine sandy loam, shallow, 5 to 25 percent slopes.	------	------	------	------	------	------	------	------	------	------	
Gloucester fine sandy loam, neutral substratum, 3 to 8 percent slopes.	6	9	30	40	1. 0	2. 0	1. 0	2. 0	1. 2	2. 2	Medium.
Gloucester fine sandy loam, neutral substratum, 8 to 15 percent slopes.	6	8	25	35	1. 0	2. 0	1. 0	2. 0	1. 2	2. 2	Medium.
Granby fine sandy loam, 0 to 2 percent slopes	------	------	------	------	------	------	------	------	------	------	
Groveton fine sandy loam, 0 to 3 percent slopes	7	10	30	45	1. 5	2. 2	1. 0	2. 0	. 8	1. 8	Medium.
Hartland very fine sandy loam, 2 to 6 percent slopes	9	12	35	50	1. 5	2. 5	1. 0	2. 0	1. 5	2. 5	Medium.
Hartland very fine sandy loam, 6 to 12 percent slopes.	8	11	35	50	1. 5	2. 5	1. 0	2. 0	1. 5	2. 5	Medium.
Hartland very fine sandy loam, 12 to 20 percent slopes.	7	10	30	40	1. 5	2. 5	1. 0	2. 0	1. 5	2. 5	High.
Herkimer silt loam, neutral, 0 to 3 percent slopes	10	13	40	55	1. 5	2. 5	1. 0	2. 0	2. 0	3. 0	Low.
Herkimer silt loam, neutral, 3 to 8 percent slopes	10	13	40	55	1. 5	2. 5	1. 0	2. 0	2. 0	3. 0	Low.
Herkimer silt loam, neutral, 8 to 15 percent slopes	8	11	35	50	1. 5	2. 5	1. 0	2. 0	2. 0	3. 0	Low.
Herkimer silt loam, acid, 0 to 3 percent slopes	10	13	40	55	1. 3	2. 5	1. 0	2. 0	1. 5	3. 0	Low.
Herkimer silt loam, acid, 3 to 8 percent slopes	10	13	40	55	1. 3	2. 5	1. 0	2. 0	1. 5	3. 0	Low.
Herkimer silt loam, acid, 8 to 15 percent slopes	8	11	35	50	1. 3	2. 5	1. 0	2. 0	1. 5	3. 0	Low.
Herkimer silt loam, 15 to 25 percent slopes	------	------	25	35	1. 0	1. 8	. 8	1. 3	1. 2	2. 4	High.
Hinckley sandy loam, neutral substratum, 0 to 3 percent slopes.	5	9	20	30	1. 0	1. 5	. 8	1. 2	1. 0	1. 8	High.
Hinckley sandy loam, neutral substratum, 3 to 8 percent slopes.	5	9	20	30	1. 0	1. 5	. 8	1. 2	1. 0	1. 8	High.
Hinckley sandy loam, neutral substratum, 8 to 15 percent slopes.	4	7	18	25	1. 0	1. 5	. 8	1. 2	1. 0	1. 8	High.
Houseville silt loam, neutral, 0 to 3 percent slopes	9	12	35	50	1. 5	2. 5	1. 0	2. 0	1. 0	1. 5	Low.
Houseveille silt loam, neutral, 3 to 8 percent slopes.	9	12	35	50	1. 5	2. 5	1. 0	2. 0	1. 0	1. 6	Low.
Houseville silt loam, acid, 0 to 3 percent slopes	9	12	35	50	1. 3	2. 5	1. 0	2. 0	. 8	1. 5	Low.
Houseville silt loam, acid, 3 to 10 percent slopes	8	11	30	45	1. 3	2. 5	1. 0	2. 0	. 8	1. 5	Low.
Howard loam, 0 to 3 percent slopes	9	12	40	55	1. 3	2. 5	1. 0	2. 0	2. 0	3. 0	Medium.
Howard loam, 3 to 8 percent slopes	9	12	40	55	1. 3	2. 5	1. 0	2. 0	2. 0	3. 0	Medium.
Howard loam, 8 to 15 percent slopes	8	11	35	50	1. 3	2. 5	1. 0	2. 0	2. 0	2. 8	Medium.
Howard and Kars soils, 15 to 35 percent slopes	------	------	------	------	1. 0	1. 8	. 8	1. 3	1. 0	2. 0	High.
Hudson silt loam, 0 to 6 percent slopes	9	12	40	55	1. 0	2. 0	1. 5	2. 5	1. 8	2. 5	Low.
Ilion silt loam, 0 to 3 percent slopes	6	9	20	30	1. 2	2. 0	. 8	1. 5	------	------	Medium.
Ilion silt loam, 3 to 8 percent slopes	7	10	22	33	1. 2	2. 0	. 8	1. 5	------	------	Medium.
Junius fine sandy loam, 0 to 3 percent slopes	6	9	20	30	1. 2	2. 0	. 8	1. 5	------	------	Medium.
Kars gravelly loam, 0 to 3 percent slopes	8	12	35	45	1. 2	2. 5	1. 0	2. 0	2. 0	3. 0	Medium.
Kars gravelly loam, 3 to 8 percent slopes	8	12	35	45	1. 2	2. 5	1. 0	2. 0	2. 0	3. 0	Medium.
Kars gravelly loam, 8 to 15 percent slopes	7	9	30	40	1. 2	2. 5	1. 0	2. 0	2. 0	3. 0	Medium.
Kendaia silt loam, 0 to 3 percent slopes	6	9	25	35	1. 5	2. 5	1. 0	2. 0	------	------	Medium.
Kendaia silt loam, 3 to 8 percent slopes	6	9	25	35	1. 5	2. 5	1. 0	2. 0	------	------	Medium.
Kendaia silt loam, shallow, 0 to 3 percent slopes	4	6	20	30	1. 0	1. 5	. 8	1. 0	------	------	High.
Kendaia silt loam, shallow, 3 to 8 percent slopes	4	6	20	30	1. 0	1. 5	. 8	1. 0	------	------	High.
Kendaia very stony silt loam, 0 to 15 percent slopes.	------	------	------	------	------	------	------	------	------	------	
Lobdell silt loam, 0 to 2 percent slopes	9	12	40	55	1. 5	2. 5	1. 0	2. 0	1. 5	2. 2	Low.
Lobdell shaly silt loam, 0 to 3 percent slopes	9	12	40	55	1. 5	2. 5	1. 0	2. 0	1. 2	2. 2	Low.
Lyons silt loam, 0 to 3 percent slopes	------	------	------	------	------	------	------	------	------	------	
Lyons silt loam, shallow, 0 to 3 percent slopes	------	------	------	------	------	------	------	------	------	------	

TABLE 44.—*Estimated long-term average acre yields of principal crops to be expected under two levels of management*—Con.

Soil name	Corn silage		Oats		Clover-grass hay		Grass hay		Alfalfa-grass hay		Yield variability
	A	B	A	B	A	B	A	B	A	A	
	Tons	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	
Lyons very stony silt loam, 0 to 3 percent slopes	------	------	------	------	------	------	------	------	------	------	
Madalin silt loam, 0 to 2 percent slopes	6	8	20	30	1.4	2.0	1.0	2.0	------	------	High.
Made land	------	------	------	------	------	------	------	------	------	------	
Manheim silt loam, 0 to 3 percent slopes	9	12	35	50	1.5	2.5	1.0	2.0	1.0	1.5	Low.
Manheim silt loam, 3 to 8 percent slopes	9	12	35	50	1.5	2.5	1.0	2.0	1.0	1.8	Low.
Manlius silt loam, 0 to 8 percent slopes	5	7.5	18	25	.8	1.5	.6	1.2	.5	1.5	High.
Manlius silt loam, 8 to 15 percent slopes	4	6	16	20	.8	1.2	.5	1.0	.5	1.4	High.
Manlius silt loam, 15 to 35 percent slopes	------	------	------	------	.5	1.0	.5	.8	------	------	High.
Marcy silt loam, 0 to 3 percent slopes	5	8	20	30	1.0	1.5	.8	1.2	------	------	High.
Marcy silt loam, 3 to 8 percent slopes	6	9	20	30	1.0	1.5	.8	1.2	------	------	High.
Melrose sandy loam, 0 to 6 percent slopes	9	12	35	50	1.5	2.5	1.0	2.0	1.2	1.8	Low.
Melrose sandy loam, 6 to 12 percent slopes	8	11	30	45	1.5	2.4	1.0	2.0	1.2	2.0	Low.
Mohawk silt loam, 2 to 8 percent slopes	9	12	40	55	1.5	2.5	1.0	2.0	2.0	3.0	Low.
Mohawk silt loam, 8 to 15 percent slopes	8	11	35	50	1.5	2.5	1.0	2.0	2.0	3.0	Low.
Mohawk silt loam, 15 to 25 percent slopes	------	------	25	35	1.2	1.8	1.0	2.0	1.2	1.8	High.
Nellis loam, deep, 2 to 8 percent slopes	9	12	40	55	1.8	2.5	1.0	2.0	2.0	3.0	Low.
Nellis loam, deep, 8 to 15 percent slopes	8	11	35	50	1.5	2.5	1.0	2.0	2.0	3.0	Low.
Nellis loam, moderately deep, 2 to 8 percent slopes	8	11	40	55	1.2	2.0	1.0	2.0	2.0	2.5	Medium.
Nellis loam, moderately deep, 8 to 15 percent slopes.	7	9	35	50	1.2	2.0	1.0	2.0	2.0	2.5	Medium.
Nellis loam, moderately deep and deep, 15 to 25 percent slopes.	------	------	25	35	1.0	1.8	.8	1.3	1.5	2.0	High.
Nellis loam, shallow, 0 to 8 percent slopes	5	8	18	28	.5	1.0	.5	1.0	.8	1.5	High.
Nellis loam, shallow, 8 to 15 percent slopes	4	7	15	25	.4	.9	.4	.8	.5	1.0	High.
Nellis loam, shallow, 15 to 25 percent slopes	------	------	------	------	------	------	------	------	------	------	
Nellis loam, 25 to 35 percent slopes	------	------	------	------	------	------	------	------	------	------	
Nellis very stony loam, 3 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	
Nellis very stony loam, 15 to 35 percent slopes	------	------	------	------	------	------	------	------	------	------	
Nellis loam, ledgy, 3 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	
Nellis loam, ledgy, 15 to 35 percent slopes	------	------	------	------	------	------	------	------	------	------	
Ondawa loam, 0 to 2 percent slopes	9	11	30	45	1.5	2.5	.8	1.8	1.2	2.2	Low.
Ondawa loamy sand, 2 to 5 percent slopes	5	7	25	35	1.0	2.0	.8	1.5	1.0	2.0	High.
Peat and muck, deep	------	------	------	------	------	------	------	------	------	------	
Peat and muck, shallow	------	------	------	------	------	------	------	------	------	------	
Petoskey fine sandy loam, 0 to 3 percent slopes	8	11	35	50	1.2	2.4	.8	1.6	2.0	2.8	Medium.
Petoskey fine sandy loam, 3 to 8 percent slopes	8	11	35	50	1.2	2.4	.8	1.6	2.0	2.8	Medium.
Petoskey fine sandy loam, 8 to 15 percent slopes	7	9	30	45	1.2	2.4	.8	1.4	1.8	2.5	Medium.
Petoskey fine sandy loam, 15 to 25 percent slopes	------	------	------	------	1.0	1.6	.7	1.2	1.0	1.7	High.
Petoskey and Hartland fine sandy loams, 25 to 35 percent slopes.	------	------	------	------	------	------	------	------	------	------	
Pinckney silt loam, 3 to 8 percent slopes	6	9	25	35	1.0	2.0	.8	1.8	1.0	1.8	Medium.
Pinckney silt loam, 8 to 15 percent slopes	5	8	22	30	1.0	2.0	.8	1.8	1.0	1.8	Medium.
Pinckney silt loam, 15 to 25 percent slopes	------	------	------	------	.8	1.5	.5	1.0	.8	1.5	High.
Pinckney silt loam, 25 to 35 percent slopes	------	------	------	------	------	------	------	------	------	------	
Pinckney silt loam, 15 to 35 percent slopes, eroded	------	------	------	------	------	------	------	------	------	------	
Podunk loam and fine sandy loam, 0 to 2 percent slopes.	8	11	30	40	1.4	2.2	1.0	2.0	.7	1.2	High.
Poland silt loam, 3 to 8 percent slopes	8	11	40	55	1.5	2.0	1.0	2.0	1.5	2.5	Low.
Poland silt loam, 8 to 15 percent slopes	6	9	30	40	1.2	2.0	1.0	1.8	1.4	2.2	Low.
Poland silt loam, 15 to 25 percent slopes	------	------	18	30	1.0	1.5	.8	1.2	1.0	1.8	High.
Poland and Mohawk silt loams, 25 to 35 percent slopes.	------	------	------	------	------	------	------	------	------	------	
Rhinebeck silt loam, 1 to 6 percent slopes	8	11	35	50	1.5	2.5	1.0	2.0	1.2	2.2	Low.
Rhinebeck silt loam, 6 to 12 percent slopes	7	10	35	50	1.5	2.5	1.0	2.0	1.2	2.2	Low.
Ridgebury stony loam, 0 to 5 percent slopes	5	7	20	30	1.2	1.7	.6	1.3	------	------	High.
Ridgebury soils, extremely stony, 0 to 8 percent slopes.	------	------	------	------	------	------	------	------	------	------	
Riverwash	------	------	------	------	------	------	------	------	------	------	
Rockland, gneiss	------	------	------	------	------	------	------	------	------	------	
Rockland, limestone	------	------	------	------	------	------	------	------	------	------	
Rough broken land	------	------	------	------	------	------	------	------	------	------	
Rumney silt loam, 0 to 2 percent slopes	------	------	------	------	1.0	1.5	.7	1.3	------	------	High.
Saco silt loam, 0 to 2 percent slopes	------	------	------	------	------	------	------	------	------	------	
Saugatuck loamy fine sand, 0 to 3 percent slopes	5	7	20	30	1.0	1.5	.5	1.0	------	------	Medium.
Scantic silty clay loam, 0 to 3 percent slopes	------	------	25	35	1.2	2.0	1.0	1.5	------	------	Medium.
Scantic silt loam, 0 to 6 percent slopes	6	9	25	35	1.2	2.0	1.0	1.5	------	------	Medium.
Scarboro fine sandy loam, 0 to 2 percent slopes	------	------	------	------	------	------	------	------	------	------	
Scarboro loamy sand, neutral phase, 0 to 2 percent slopes.	------	------	------	------	------	------	------	------	------	------	

TABLE 44.—*Estimated long-term average acre yields of principal crops to be expected under two levels of management*—Con.

Soil name	Corn silage		Oats		Clover-grass hay		Grass hay		Alfalfa-grass hay		Yield variability
	A	B	A	B	A	B	A	B	A	A	
Scituate stony fine sandy loam, 3 to 8 percent slopes.	6	8	22	34	1.0	1.8	.8	1.2	------	------	Medium.
Scituate very stony fine sandy loam, 3 to 15 percent slopes.	------	------	------	------	------	------	------	------	------	------	
Sloan silt loam, 0 to 2 percent slopes	------	------	------	------	------	------	------	------	------	------	
Suffield silt loam, 0 to 2 percent slopes	9	12	35	50	1.4	2.2	1.0	2.0	1.0	2.5	Low.
Suffield silt loam, 2 to 6 percent slopes	9	12	35	50	1.4	2.2	1.0	2.0	1.0	2.5	Low.
Suffield and Hudson silt loams, 6 to 12 percent slopes.	8	11	30	45	1.4	2.2	1.0	2.0	1.0	2.4	Low.
Swanton fine sandy loam, 0 to 2 percent slopes	5	9	25	33	1.2	2.0	.8	1.3	------	------	Medium.
Tughill stony and very stony silt loams, 0 to 5 percent slopes.	------	------	------	------	------	------	------	------	------	------	
Turin silt loam, 0 to 3 percent slopes	8	11	25	45	1.0	2.0	.8	1.5	.6	1.3	Medium.
Turin silt loam, 3 to 8 percent slopes	8	10	25	45	1.0	2.0	.8	1.5	.6	1.3	Medium.
Turin silt loam, 8 to 15 percent slopes	7	9	25	38	1.0	2.0	.8	1.5	.6	1.3	Medium.
Wallkill silt loam, 0 to 2 percent slopes	------	------	------	------	------	------	------	------	------	------	
Walpole loam, 0 to 4 percent slopes	5	7	18	25	1.0	1.6	.5	1.2	------	------	High.
Wayland silt loam, 0 to 2 percent slopes	------	------	------	------	1.0	1.8	.8	1.5	------	------	High.
Westbury stony loam, 0 to 3 percent slopes	4	6.5	18	25	1.0	1.5	.5	1.0	------	------	High.
Westbury stony loam, 3 to 8 percent slopes	4	6	18	25	1.0	1.5	.5	1.0	------	------	High.
Westbury very stony loam, 0 to 8 percent slopes	------	------	------	------	------	------	------	------	------	------	
Westland silt loam, 0 to 2 percent slopes	------	------	------	------	------	------	------	------	------	------	
Whately fine sandy loam, 0 to 2 percent slopes	------	------	------	------	------	------	------	------	------	------	
Whitman soils, extremely stony, 0 to 8 percent slopes.	------	------	------	------	------	------	------	------	------	------	
Worth stony loam, 3 to 8 percent slopes	6	9	30	45	1.5	2.2	.8	1.8	1.0	2.0	Medium.
Worth stony loam, 8 to 15 percent slopes	5	8	28	40	1.1	2.0	.8	1.6	1.0	2.0	Medium.
Worth stony loam, 15 to 25 percent slopes	------	------	------	------	1.0	1.4	.5	1.0	.8	1.5	High.
Worth flaggy silt loam, 3 to 8 percent slopes	7	10	30	45	1.3	2.5	1.0	1.8	1.0	2.0	Medium.
Worth flaggy silt loam, 8 to 15 percent slopes	6	8	28	40	1.3	2.5	1.0	1.8	1.0	2.0	Medium.
Worth very stony loam, 3 to 15 percent slopes	------	------	------	------	------	------	------	------	------	------	
Worth very stony loam, 15 to 35 percent slopes	------	------	------	------	------	------	------	------	------	------	

TABLE 45.—*Two levels of fertilization for a 5-year dairy-farm rotation*

[Rates in columns A are needed to get yields in columns A of table 44; those in columns B are needed to get yields in columns B.

[For columns A, the soils have received some lime but only enough to bring the pH to 5.5 for all crops but alfalfa and to 6.0 for alfalfa; for columns B, the soils have received enough lime to bring the pH of the plow layer to 6.5; for soils having an initial pH higher than 6.5, yields are for unlimed soil]

Rotation	Pounds per acre available—					
	Nitrogen (N) [1]		Potassium (K_2O) [1]		Phosphorus (P_2O_5) [1]	
	A	B	A [2]	B [3]	A	B
Corn for silage	20–30	40–50	20–30	40–50		
Oats	20–25	30–35	20–25	30–35		
Clover-grass hay [4]	0	0	20–30	40–50	[5] 110–150	110–150
Grass hay [6]	0	30–40	0	0		
Alfalfa [7]	0	0	20–30	40–50		

[1] Nitrogen, potassium, and phosphorus are from both manure and commercial fertilizer.

[2] Rates in this column give yields in columns B, table 44, for soils high in potassium.

[3] Rates in this column are for soils medium to low in potassium.

[4] The yields of clover-grass hay in table 44 are for first-year hay; the mixture consisted of red and ladino clovers seeded with timothy.

[5] Averages 20 to 30 pounds per acre per year for the rotation; all phosphorus needed for the rotation can be applied at one time.

[6] The grass-hay yields in table 44 are for second-year hay after most of the legumes have died out.

[7] The yields of alfalfa-grass hay in table 44 are for first-year hay with alfalfa the dominant legume.

Levels of management.—Columns A of table 44, give estimated yields under a level of management that is common on the dairy farms of Lewis County. The estimates are based on available records of yields. Columns B give estimated yields that could be obtained under a somewhat higher level of liming and fertilization than is common. The trend on many dairy farms is toward this higher level. The estimates in the B columns were computed by using records of yields on experimental plots and yield records kept by farmers for certain soils. Knowledge of the properties of each soil was used to predict what response could be expected from improved management.

Basis for estimates.—Yield estimates are based on information from the following sources: (1) Records of measured yields obtained by conducting short-term tests on specific soils; (2) records of yields obtained under certain management practices reported by farmers for crops on specific soils; (3) observations of crops and interviews with farmers during the course of the survey; (4) knowledge of soil properties that are known to affect yields; and (5) average yield figures, derived from agricultural census data, for all soils and all management practices.

Soil Associations

This section is for persons interested in the soils in areas larger than individual mapping units. Several soils are discussed together in soil associations. A soil association is an area of land made up of one or more soils that occur in a characteristic pattern; the soils in the pattern may differ in important characteristics.

A soil association is named for the most extensive soil or soils in the area. Sometimes a single series dominates in an association; for example, the Kars association in Lewis County consists mainly of one soil that is characteristically associated with smaller areas of other soils. More commonly an association will be named for 2 or 3 soil series, each of which makes up a significant proportion of the association. The Nellis-Amenia association is an example.

A colored map showing the soil associations of Lewis County is in the envelope at the back of this report. This map is helpful in studying the soils of the county for general or broad program planning. It is not sufficiently detailed to be useful in studying the soils of a farm. The map was made (1) by generalizing the information obtained through detailed mapping of the better agricultural land in the central valley area and (2) by reconnaissance mapping of the forested areas. Soils of the Becket, Hermon, and Waumbek series were mapped only in the reconnaissance survey.

The soil associations are described in the same order as they are listed in the legend at the back of the report. The soil series referred to in the various associations are described in the section, Soil Series and Mapping Units. The soil properties that affect use and management are discussed in the section, Management of the Soils. Table 46 gives estimates of the relative percentages of soils of different quality in each association.

Nellis-Amenia

In this association are dominantly deep, well drained and moderately well drained soils on high-lime glacial till. The percentages of the soils in the association are approximately as follows:

Nellis	40 to 60	Kendaia	10 to 15
Amenia	25 to 30	Lyons	5 to 10

The Nellis and Amenia are the well drained and moderately well drained soils of the association. The Kendaia are poorly drained, and the Lyons are very poorly drained. The soils of this association are normally more than 40 inches deep to bedrock. The relief is favorable, as few slopes are greater than 15 percent. Soils excellent for crops are dominant in this association (table 46).

The soils are well suited to all the crops commonly grown in the county and respond to good management. In most areas the need for lime is low, but in some the acid surface soil may require a light application of lime if a seeding of legumes is to be established. The parent material is calcareous, even where the surface soil is acid. Legumes, therefore, will persist longer on soils of this association than on most other soils of the county. Moderate amounts of phosphate and potash are required for all the soils of this association.

Poland-Mohawk-Manheim

In this association are dominantly deep, well drained and moderately well drained soils on high-lime glacial till. The percentages of the soils in the association are approximately as follows:

Poland	25 to 50	Ilion	10 to 25
Mohawk	25 to 50	Fonda	5 to 10
Manheim	15 to 25		

The Poland and Mohawk are the well drained and the Manheim are the moderately well drained soils of the association. The Ilion are poorly drained, and the Fonda are very poorly drained. The Poland soils are lighter colored and more acid than the Mohawk and Manheim soils.

This association occurs mainly in the western part of the county in the towns of Pinckney and Leyden. If well managed, the dominant soils are well suited to most of the crops commonly grown in the county (table 46). Poor drainage or steep slopes make about 10 percent of the association unsuited to crops.

The Poland soils have a high requirement for lime. They especially need lime if legumes are to be grown. The Mohawk soils are very well suited to alfalfa and other legumes. The Mohawk and Manheim soils have a low requirement for lime and a medium requirement for potash. All of the soils need phosphate.

Because the slopes in much of the association are somewhat steep, practices to conserve soil and water are needed. Practices that will help to maintain the supply of organic matter and nitrogen include using liberal amounts of manure and growing winter cover crops and legumes in sod-forming crops.

TABLE 46.—*Soil associations and relative percentages of soils of different quality in each*

Symbol [1]	Soil associations	Soil quality				
		Excellent	Good	Fair	Poor	Unsuited to crops
	Dominated by soils excellent for crops—	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
NA	Nellis-Amenia	60	25	7	5	3
HH	Herkimer-Houseville	60	20	10	5	5
H	Howard	90	----	----	10	----
K	Kars	95	----	----	5	----
	Dominated by good soils for crops—					
PM	Poland-Mohawk-Manheim	15	50	10	15	10
PT	Poland-Turin-Ilion	----	50	35	10	5
GE	Genesee-Eel	20	60	15	5	----
PK	Petoskey-Kars	10	40	20	15	15
HR	Hudson-Rhinebeck	15	65	10	5	5
HB	Hartland-Buxton	----	50	25	15	10
SB	Scantic-Buxton	----	55	30	10	5
	Dominated by fair soils for crops—					
TI	Turin-Ilion	----	10	60	25	5
WE	Worth-Empeyville-Westbury	----	----	65	25	10
EW	Empeyville-Worth	----	----	55	30	15
RK	Camroden-Pinckney-Marcy	----	----	65	25	10
RA	Camroden-Marcy	----	----	60	30	10
GS	Gloucester-Ridgebury	----	5	35	25	35
ES	Essex-Scituate	----	10	40	20	30
GR	Gloucester	----	5	35	30	30
PO	Podunk-Ondawa-Saco	----	10	45	20	25
	Dominated by poor soils for crops—					
C	Colosse	----	5	10	45	40
KR	Pinckney-Manlius-Camroden	----	----	15	40	45
AL	Marcy-Alden-Camroden	----	----	10	50	40
B	Bonaparte	----	5	10	60	25
HA	Hinckley	----	----	----	75	25
A	Adams-Colton	----	----	10	50	40
CA	Croghan-Adams	----	----	10	60	30
SC	Saugatuck-Croghan	----	----	10	40	50
CD	Colton	----	----	5	50	45
CAM	Colton-Adams-Gloucester	----	----	5	30	65
SD	Scarboro-Duane	----	----	5	25	70
NS	Nellis-Amenia, shallow	----	5	10	75	10
NK	Nellis-Kendaia	----	5	10	50	35
DA	Dover-Amenia	----	10	10	40	40
WS	Swanton-Whately	----	----	5	55	40
SW	Sloan-Wayland	----	----	----	50	50
SR	Saco-Rumney	----	----	10	50	45
	Dominated by soils unsuited to crops and mainly in forest—					
EB	Empeyville-Westbury-Worth	----	----	----	----	100
BU	Westbury-Tughill-Empeyville	----	----	----	----	100
RG	Ridgebury-Gloucester-Rockland	----	----	----	----	100
HBR	Hermon-Becket-Ridgebury	----	----	----	----	100
HBW	Becket-Hermon-Waumbek	----	----	----	----	100
HWR	Hermon-Ridgebury-Rockland	----	----	----	----	100
P	Peat and muck	----	----	----	----	100
RM	Rockland, gneiss and granite	----	----	----	----	100
RL	Rockland, limestone	----	----	----	----	100

[1] See soil association map at back of report.

Poland-Turin-Ilion

In this association are dominantly deep, well drained and moderately well drained soils on high-lime glacial till. The percentages of the soils in the association are approximately as follows:

Poland	30 to 40	Ilion	15 to 25
Turin	25 to 40	Fonda	5 to 15

The Poland are the well-drained soils of the association. The Turin are dominantly moderately well drained, although their drainage ranges to somewhat poor. The Ilion are poorly drained, and the Fonda are very poorly drained.

This association occurs in the northwestern part of the county, mainly in the towns of Denmark and Lowville. It consists mainly of soils that are good for crops (table 46). The parent material was derived largely from gray shale and sandstone, but partly from dark-colored limestone. Even though the uppermost layers of the soils are acid, the soils are alkaline at depths of about 30 inches. Free lime occurs at depths of 36 to 42 inches.

The Poland soils are well suited to corn, oats, hay, and other crops commonly grown in the county. If adequate amounts of lime are applied, they are suited to alfalfa-grass mixtures. Because the Turin soils are not so well drained as the Poland soils, they are less well suited to alfalfa, but they are suited to birdsfoot trefoil.

All of the soils in this association require phosphate, but their requirement for potash is moderate to low. Generally, adequate potassium will be received if manure is added. To get good yields of corn on these soils, it is necessary to apply commercial fertilizer in the row at the time the corn is planted. Tilling on the contour and using broad stripcropping on the long slopes are needed to control runoff.

Dover-Amenia

In this association are dominantly deep, stony soils on high-lime glacial till. In addition to being stony, the soils have outcrops of crystalline limestone and Adirondack gneiss in many places. The percentages of the soils in the association are approximately as follows:

Dover, stony	30 to 50	Rockland, limestone	5 to 10
Dover, very stony	30 to 40	Rockland, gneiss	5 to 10
Amenia	15 to 20		

The Dover are the well-drained soils of the association. The Amenia are the dominantly moderately well drained soils, but their drainage ranges to somewhat poor. The association occurs only in the vicinity of Bonaparte and Harrisville. It consists mainly of soils that are poor for crops (table 46). Dairying is the only farm enterprise, and oats and hay are the principal crops.

In the areas that are not too stony or steep, the soils are productive and respond well to management. They need little lime to grow legumes, but they require phosphate and potash. The Dover and Amenia soils are well suited to alfalfa. Practices to maintain the supply of organic matter and plant nutrients are needed.

Nellis-Amenia, Shallow

In this association are dominantly shallow soils on high-lime glacial till. The percentages of the soils in the association are approximately as follows:

Nellis, shallow	50 to 75	Kendaia, shallow	10 to 15
Amenia, shallow	20 to 35	Lyons	0 to 5

The Nellis are the well-drained soils of the association. The Amenia are dominantly moderately well drained, but their drainage ranges to somewhat poor. The Kendaia are poorly drained, and the Lyons are very poorly drained. Depth to bedrock ranges from 12 to 24 inches.

This association occurs on the limestone benches between the Black River and the Tug Hill escarpment. This escarpment is the eastern edge of the Tug Hill Plateau, which lies west of the Adirondack Province and is separated from it by the valley of the Black River. Some of the areas are large enough so that an entire farm is on a single soil. Soils that are poor for crops are dominant (table 46).

About 75 percent of the association is potential cropland, and much of it is being farmed. Fair yields of corn, oats, and hay are produced on the deeper soils, but lack of moisture limits yields on the shallower soils. The legumes to which the soils are best suited are alfalfa and birdsfoot trefoil. In most areas little lime need be added for legumes. The soils are low in phosphorus, and the supply of available potassium is medium to low. Practices to maintain the supply of organic matter and plant nutrients are needed.

Nellis-Kendaia

In this association, which occurs mainly in the towns of Denmark and Lowville, are dominantly shallow soils on high-lime glacial till. The percentages of the soils in the association are approximately as follows:

Nellis, shallow	60 to 80	Rockland, limestone	5 to 10
Kendaia, shallow	15 to 25		

The Nellis are the well drained and the Kendaia are the poorly drained soils of the association. Depth to limestone bedrock averages less than 24 inches in these soils. Although about 60 percent of the acreage can be used for crops, soils poor for crops are dominant (table 46).

On the Nellis soils crops do not grow well because they do not have enough moisture during the growing season. The Kendaia soils are too wet for many crops, and the bedrock is too close to the surface for open ditches to be used to drain them. Most of the association is in permanent pasture, which is probably its best use.

Turin-Ilion

In this association are dominantly deep, somewhat poorly drained soils on high-lime glacial till. The approximate percentages of the soils in the association are as follows:

Turin	40 to 60	Poland	5 to 15
Ilion	20 to 30	Fonda	5 to 15

The Turin soils of this association are moderately well drained to somewhat poorly drained. The Ilion are poorly drained to somewhat poorly drained, and the Poland are well drained. The Fonda is very poorly drained. Included are some small areas of Marcy and Camroden soils in which the drainage ranges from moderately good to poor.

This association occurs mainly along the northern edge of the Tug Hill Plateau in the town of Harrisburg. Soils fair for crops are dominant (table 46). Dairying is the only farm enterprise.

Because the dominant drainage in this association is somewhat poor, the soils are best suited to pasture, hay, and oats. They are not suited to alfalfa, but birdsfoot trefoil and ladino clover grow well under good management. The soils all need moderate amounts of lime. They are low in phosphorus but are medium to high in available potassium.

Camroden-Pinckney-Marcy

In this association are dominantly acid soils with neutral to slightly acid fragipans. The soils have formed on glacial till. They are dominantly deep and are well drained to moderately well drained. The percentages of the soils in the association are approximately as follows:

Camroden	40 to 60	Marcy	15 to 25
Pinckney	20 to 35	Alden	10 to 15

The Pinckney are the well-drained soils of the association. The Camroden are dominantly moderately well drained,

but their drainage ranges to somewhat poor. The Marcy soils are poorly drained, and the Alden is very poorly drained. This association occurs on the Tug Hill Plateau, mainly near Copenhagen and in the towns of Martinsburg and Turin. It consists largely of soils that are fair for crops (table 46).

The Camroden soils have a strongly developed fragipan, but in the Pinckney soils the fragipan is less compact. The surface layer and the upper part of the subsoil of the Camroden and Pinckney soils are very strongly acid. The lower part of the subsoil is less acid, and in places it is neutral or alkaline. In the Marcy and Alden soils, the surface layer and the upper part of the subsoil are less acid than in the Camroden and Pinckney.

In areas where the Camroden soils are dominant, the relief is gently to moderately rolling. Where the Pinckney soils are dominant, it is moderately to strongly rolling. The Marcy and Alden soils are nearly level or depressed.

The growing season is short in the areas where this association occurs, and corn does not always mature. In many areas of the Camroden soils, the growth of crops is retarded by the strong fragipan and the somewhat restricted drainage. On these areas birdsfoot trefoil and ladino clover are the legumes to which the soils are best suited. All of the soils of the association require lime and are low in phosphorus. Their ability to supply potassium is medium. Practices to maintain fertility are needed, and erosion control is required where the slopes are strong.

Camroden-Marcy

In this association are dominantly deep, acid soils with neutral to slightly acid fragipans. The soils have formed on glacial till. The percentages of the soils in the association are approximately as follows:

Camroden	40 to 60	Pinckney	10 to 20
Marcy	30 to 40	Alden	5 to 10

The Camroden are the moderately well drained soils of this association, although their drainage ranges to somewhat poor. The Pinckney are well drained, the Marcy are poorly drained, and the Alden is very poorly drained. The association occurs along the outer edges of the Tug Hill Plateau, mainly in the towns of Pinckney and Harrisburg.

Soils for crops are dominant in this association (table 46). They are gently rolling and are fairly smooth. Dairying is the only farm enterprise.

Much of this association has been purchased by the State and is being reforested. Except for the areas along State and county highways, the rest is idle or abandoned. In a large part of the association, the acid reaction of the soils and the strong fragipan and restricted drainage hinder the growth of crops. The growing season is generally too short for corn to mature. The legumes best suited to meadows on these soils are ladino clover and birdsfoot trefoil. All of the soils require lime and phosphate, but their ability to supply potassium is medium. They need practices that will maintain fertility.

Marcy-Alden-Camroden

In this association are dominantly deep, acid soils with neutral to slightly acid fragipans. The soils have formed on glacial till. The percentages of the soils in the association are approximately as follows:

Marcy	40 to 50	Camroden	15 to 25
Alden	25 to 30	Pinckney	5 to 15

The Marcy are the poorly drained soils in this association, and the Alden is the very poorly drained soil. The Pinckney are well drained, and the Camroden are moderately well drained. The association occurs in the town of Pinckney. Soils poor for crops are dominant (table 46).

Although the soils are not well suited to that purpose, much of this association is used for crops. Some areas are used for hay, but a larger acreage is used for pasture. All of the soils are slightly to moderately acid. They are low in phosphorus, and their ability to supply potassium is medium. The areas that are used for crops need improved drainage. Pastured areas need to be kept clear of brush.

Pinckney-Manlius-Camroden

In this association are dominantly shallow, acid soils with neutral to slightly acid fragipans. The soils have formed on glacial till. The percentages of the soils in the association are approximately as follows:

Pinckney	40 to 55	Camroden	15 to 25
Manlius	25 to 45	Gage	5 to 15

The Pinckney and Manlius are the well-drained soils of the association. The Camroden are moderately well drained to somewhat poorly drained, and the Gage are poorly drained. The Manlius and Gage are the shallowest of the soils.

This association occurs only in the western part of the county. It is mainly on the steep escarpment on the east side of Tug Hill, but one area, not far from the Jefferson County line, extends from New Boston to beyond Montague. Soils that are poor for crops because they are shallow or have steep slopes are dominant (table 46).

The soils of this association are used mainly for pasture, but the pastures are poor and brushy. The legumes to which they are best suited are ladino clover and birdsfoot trefoil. All of the soils are strongly acid; lime is needed if legumes are to grow well. The soils are low in phosphorus, and their ability to supply potassium is medium to low. They need practices to maintain fertility and to prevent erosion. The pastured areas should be cleared of brush.

Worth-Empeyville-Westbury

The dominant soils in this association are strongly acid and have acid fragipans or substrata. They are moderately stony, well drained and moderately well drained soils on glacial till derived mainly from sandstone. The percentages of the soils in the association are approximately as follows:

Worth	40 to 60	Westbury	15 to 25
Empeyville	20 to 40	Tughill	10 to 15

The Worth are the well-drained soils of the association. The Empeyville are dominantly moderately well drained, but their drainage ranges to somewhat poor. The Westbury are poorly drained to somewhat poorly drained, and the Tughill are very poorly drained. In some places the poorly drained soils surround areas of the well-drained Worth soils. This association occupies interior positions on the Tug Hill Plateau between the towns of Montague

and Lewis. The relief ranges from rolling to strongly rolling.

Soils fair for crops are dominant in this association (table 46). The drainage varies, and the soils may be too wet in one place and too dry a short distance away. The many stones, mainly sandstone flags, hinder tillage. Many of the stones have been removed and have been piled in various places in the fields, but additional stones need to be removed after each plowing. Pasture is the best use for the soils. Many of the pastures, however, are weedy, and the stand is thin and does not include legumes. If good management is used, alfalfa can be grown on the Worth soils. The other soils of the association are better suited to birdsfoot trefoil.

All of the soils are strongly acid. Heavy applications of lime are needed for legumes to grow well. The soils are low in phosphorus, and their ability to supply potassium is low.

Because of the deep snows in winter and the high cost of keeping roads open to the areas, much of this association has been abandoned. The areas are being reforested by planting or by natural restocking.

Empeyville-Worth

In this association are soils that are dominantly deep, moderately stony, and well drained or moderately well drained. The soils are strongly acid and have acid fragipans or substrata. The percentages of the soils in the association are approximately as follows:

Empeyville	40 to 65	Westbury	10 to 20
Worth	15 to 25	Tughill	5 to 15

The Worth are the well-drained soils of the association. The Empeyville are moderately well drained, but their drainage ranges to somewhat poor. The Westbury are poorly drained to somewhat poorly drained, and the Tughill are very poorly drained. This association has less strongly rolling relief and the soils are not so variable as the soils of the Worth-Empeyville-Westbury association. The areas occur adjacent to areas of Camroden, Pinckney, and associated soils that are on the outer part of the Tug Hill Plateau.

Soils that are generally low in fertility and that are only fair for crops are dominant in the association (table 46). Hay and oats are the only crops grown. Long rotations are used so the soil need be cultivated only infrequently. The most desirable legumes for pastures on these soils are ladino clover and birdsfoot trefoil.

Gloucester-Ridgebury

In this association are dominantly deep, moderately stony, well drained and moderately well drained soils that are strongly acid. The percentages of the soils in the association are approximately as follows:

Gloucester	40 to 60	Scituate	10 to 15
Ridgebury	15 to 20	Whitman	5 to 10

The Gloucester are the well drained and the Scituate are the moderately well drained to somewhat poorly drained soils of the association. The Ridgebury are poorly drained to somewhat poorly drained, and the Whitman are very poorly drained.

This association occurs in the town of Denmark in several small areas that are mainly near the Black River. It is made up of soils that are fair for crops (table 46). The soils have formed on glacial till derived mainly from gneiss and granite. They are light textured and contain many stones and boulders. The Gloucester soils are dominated by the neutral substratum phases of the series, and even though they are strongly acid in the upper part, the lower part of the subsoil and the substratum are neutral.

The soils in most of this association are too stony or too wet for cultivation and are mainly in forest. Any crops grown are used as feed for the dairy cattle. The soils are low in phosphorus, and their ability to supply potassium is low. The principal management problem is to maintain fertility.

Essex-Scituate

In this association are soils that are dominantly deep, moderately stony, and well drained or moderately well drained. The soils are strongly acid and have acid fragipans or substrata. The percentages of the soils in the association are approximately as follows:

Essex	40 to 60	Ridgebury	5 to 10
Scituate	20 to 45		

The Essex are the well-drained soils of the association. The Scituate are dominantly moderately well drained, although their drainage ranges to somewhat poor. The Ridgebury soils are poorly drained to somewhat poorly drained.

Soils fair to poor for crops are dominant in the association (table 46). They range from gently sloping to moderately sloping in relief. The areas are on the east side of the Black River. They lie between the river and the sand plain, mainly in the towns of Croghan and Lyonsdale.

The soils have formed on light-textured glacial till. Except that the fragipan in the Essex soils is more strongly developed and the proportion of poorly drained soils is less, this association is similar to the Gloucester association. Included are areas in which there are many small- to medium-sized outcrops of gneiss.

Dairying is the only farm enterprise. Although the soils are only moderately well suited to crops, about 60 percent of the association is used to grow hay and oats for the dairy cattle. Alfalfa can be grown on the well-drained soils, but birdsfoot trefoil persists longer in meadows. The soils require lime. Heavy initial applications are needed, and additional amounts must be applied every 4 or 5 years. The soils are low in phosphorus, and their ability to supply potassium is low. They need a complete fertilizer, and manure must be added for legumes to grow well.

Gloucester

In this association are dominantly deep, moderately stony, well drained and moderately well drained soils. The soils are strongly acid and have acid fragipans or substrata. The percentages of the soils in the association are approximately as follows:

Gloucester	40 to 70	Ridgebury	5 to 15
Scituate	10 to 20	Whitman	5 to 10

The Gloucester are the well-drained soils of the association. The Scituate are moderately well drained, but their drainage ranges to somewhat poor. The Ridgebury are

poorly drained, and the Whitman are very poorly drained. The relief is moderately to strongly rolling and hilly. This association occurs east of the Black River between the river and the sand plain. The areas lie between the towns of Croghan and Greig. Soils fair for crops are dominant (table 46).

Except that the Gloucester soils have a weaker fragipan and a subsoil that is less compact, the soils of this association are similar to those of the Essex-Scituate association. Included are many areas in which there are rock outcrops.

Dairying is the only farm enterprise. Only a small part of the association is used for crops, and the only crops grown are oats and hay If adequately limed and fertilized, however, the soils are moderately productive. All of the soils are strongly acid. They are deficient in phosphorus and are low in ability to supply potassium. Alfalfa can be grown on the well-drained areas, but the soils require heavy applications of lime and phosphate, and potash must be added.

Empeyville-Westbury-Worth

In this association are dominantly very stony, strongly acid soils with acid fragipans or substrata. The percentages of the soils in the association are approximately as follows:

Empeyville	40 to 60	Worth	15 to 20
Westbury	15 to 30	Tughill	10 to 20

The Worth are the well-drained soils of the association. The Empeyville are dominantly moderately well drained, although their drainage ranges to somewhat poor. The Westbury are poorly drained, and the Tughill are very poorly drained. Relief is mostly moderately to gently undulating or rolling. The areas of this association are on the forested part of the Tug Hill Plateau. Soils that are poor for crops and mainly in forest are dominant (table 46).

These soils have formed on deep glacial till derived mainly from sandstone. All but the Tughill soils have a strongly developed fragipan.

Ridgebury-Gloucester-Rockland

In this association are dominantly very stony, strongly acid soils with acid fragipans or substrata. The percentages of the soils in the association are approximately as follows:

Ridgebury	30 to 50	Rockland, gneiss	15 to 25
Gloucester	30 to 40	Whitman	10 to 15

The Gloucester soils are well drained and shallow. The Ridgebury soils are dominantly poorly drained, and the Whitman soils are very poorly drained. The association occurs northwest of Diana Center in areas where gneiss bedrock is close to the surface. Soils unsuited to crops because of shallowness, poor drainage, or many rock outcrops are dominant (table 46).

The association is mainly in forest, and the present forest cover consists mostly of brush. The soils have little value other than for wildlife or for recreational purposes.

Hermon-Becket-Ridgebury

In this association are dominantly very stony, strongly acid soils with acid fragipans or substrata. The percentages of the soils in the association are approximately as follows:

Hermon	30 to 40	Rockland, gneiss	10 to 20
Becket	30 to 40	Whitman	5 to 15
Ridgebury	15 to 20		

The Hermon and Becket soils are well drained, the Ridgebury are poorly drained to somewhat poorly drained, and the Whitman are very poorly drained. This association is extensive and includes much of the forested eastern part of the county. Soils unsuited to crops and mainly in forest are dominant (table 46).

These soils have formed on glacial till that was sandy and high in quartz. They are light textured and, in most places, very stony. There are many rock outcrops. The Becket soils have a strong fragipan, but in the Hermon soils the fragipan is weak or absent.

Included in this association are some Alluvial soils of the Ondawa catena. Also included are some soils on glacial outwash that are in the Colton catena and many small areas of peat.

Hermon-Ridgebury-Rockland

In this association are dominantly very stony, strongly acid soils with acid fragipans or substrata. The percentages of the soils in the association are approximately as follows:

Hermon	50 to 65	Rockland, gneiss	10 to 25
Ridgebury	15 to 20	Whitman	5 to 15

The Hermon are the well-drained soils of the association. The Ridgebury are dominantly poorly drained, and the Whitman are very poorly drained. This association occurs in two areas, one west of Beaver Lake and the other near Big Otter Lake. The relief is strongly rolling to hilly. Soils unsuited to crops and mainly in forest are dominant (table 46). Included in the association are some areas of Peat and muck.

Becket-Hermon-Waumbek

In this association are dominantly very stony, strongly acid soils with acid fragipans or substrata. The percentages of the soils in the association are approximately as follows:

Becket	40 to 60	Rockland, gneiss	15 to 25
Hermon	30 to 50	Whitman	5 to 10
Waumbek	15 to 25		

The Becket and Hermon are the well-drained soils of the association. The Waumbek are dominantly moderately well drained, and the Whitman are very poorly drained. The association occurs in the southeastern part of the county. The soils have milder relief than is typical for this part of the county. Soils unsuited to crops and mainly in forest are dominant (table 46).

The soils of this association have formed on sandy glacial till derived from granite. The Becket soils have a strongly developed fragipan, and the Hermon soils have a weakly developed fragipan or none. Included are some areas of Peat and muck. The areas are mainly in forest and are used for recreational purposes.

Westbury-Tughill-Empeyville

In this association are dominantly very stony, strongly acid soils with acid fragipans or substrata. The percent-

ages of the soils in the association are approximately as follows:

Westbury	30 to 45	Empeyville	15 to 20
Tughill	25 to 35	Worth	10 to 20

The Westbury are the dominantly poorly drained soils of the association, and the Tughill are the very poorly drained. The Empeyville are dominantly moderately well drained, and the Worth are well drained. Most of the soils have strongly developed fragipans.

This association occurs mainly in the central part of the Tug Hill Plateau. It has mild relief, and many of the areas are nearly level to slightly depressed. Soils unsuited to crops and mainly in forest are dominant (table 46).

Herkimer-Houseville

In this association are dominantly well drained and moderately well drained, medium textured to moderately coarse textured soils on glacial outwash, alluvial fans, and recent alluvium. The percentages of the soils in the association are approximately as follows:

Herkimer	35 to 55	Glenfield	10 to 15
Houseville	25 to 35	Westland	0 to 5
Colonie	10 to 30		

The Herkimer and Colonie are the well-drained soils of the association, and the Houseville are the somewhat poorly drained to moderately well drained. The Glenfield are poorly drained, and the Westland are very poorly drained. The relief is favorable for agriculture. The soils occur in a strip, ½ to 1 mile wide, at the base of the escarpment along the east side of the Tug Hill Plateau. Soils excellent for crops are dominant (see table 46).

Both neutral and acid phases of the Herkimer, Houseville, and Glenfield soils are in this association. The parent material of the neutral phases was derived mainly from the black, mildly calcareous shale of the Utica formation that is exposed at the base of the Tug Hill escarpment. The acid phases have formed on shaly material derived mainly from the gray, acid shale of the Lorraine formation, which overlies the Utica formation. In the uppermost 36 inches of these soils, the pH is 6.0 or above in the neutral phases and below 6.0 in the acid phases.

Most of the soils in this association are well suited to all of the crops grown in the county and respond well to good management. They are free of stones and are easy to work. The neutral and acid phases are equally productive. The neutral soils require little lime, but the acid soils need heavy applications of lime for legumes to grow well. The soils are low in phosphorus except where a reserve has been built up. They have a medium to low ability to supply potassium. Except where high yields of legumes are desired, requirements for potassium can be met by adding heavy applications of manure.

Howard

In this association are dominantly well drained and moderately well drained, medium textured to moderately coarse textured soils on glacial outwash, beaches, and recent alluvium. The percentages of the soils in the association are approximately as follows:

Howard	80 to 90	Houseville	0 to 15

The Howard soils are well drained, and the Houseville are moderately well drained to somewhat poorly drained. The relief is mainly nearly level to undulating, and only about 10 percent of the area has steep slopes. This association consists of three areas—one near Turin, another near Constableville, and another near Byron Corners. Soils excellent for crops are dominant (table 46).

The soils have formed on stratified sand and gravel derived from shale, sandstone, and limestone. Even though the surface soils are acid, free lime occurs at depths of 3 to 5 feet. Roots easily penetrate to the lime, and only light applications of ground limestone are needed to establish seedlings. The soils need phosphate but have a medium ability to supply potassium.

Most of this association is cultivated. The soils are well suited to all the crops grown in the county and are especially well suited to deep-rooted legumes. Although no special practices are needed to conserve soil and water, practices are needed to maintain organic matter and a supply of plant nutrients in the soil. Generally, the present management and use is satisfactory. It includes growing a high proportion of legumes in the meadows and adding heavy applications of manure to soils used for meadows or for corn and oats.

Kars

In this association are dominantly well drained, medium-textured soils on glacial outwash, beaches, and recent alluvium. The Kars soils, which are the only soils in the association, are excellent for crops (table 46).

These deep, level soils have formed on materials made up mainly of limestone but containing small amounts of shale. They have an alkaline surface layer, and free lime occurs at depths of 18 to 24 inches. The association occupies two areas on the west side of the Black River. These are below the first limestone terrace on stream-deposited sandy and gravelly terraces or alluvial fans. One area occurs along Mill Creek at Lowville; the other lies along a stream a few miles south of Briggs Corner. The Kars soils also occur in other places in the county, generally in association with the sandy Petoskey soils, which have steeper slopes.

The soils are very productive. They are among the best in the county for alfalfa. They are also well suited to corn and oats. The soils require no lime but need phosphate and potash. They have rapid permeability. Their supply of plant nutrients and organic matter can be maintained by applying phosphate and potash as needed, growing legumes, and applying manure where corn is grown.

Genesee-Eel

In this association are dominantly well drained and moderately well drained, medium textured to moderately coarse textured soils on glacial outwash, alluvial fans, and recent alluvium. The percentages of the soils in the association are approximately as follows:

Genesee	40 to 55	Wayland	5 to 15
Eel	20 to 35	Sloan	0 to 10

The Genesee are the well drained soils of the association, and the Eel are dominantly moderately well drained. The Wayland are poorly drained to somewhat poorly

drained, and the Sloan are very poorly drained. The soils are nearly level and are free from stones and gravel.

Some small areas of this association occur along the larger streams that head on the Tug Hill Plateau and cross areas high in lime before emptying into the Black River. Other areas are along Mill Creek and Roaring Brook near the place where the streams empty into the Black River. Here, the acid sediments have been covered with sediments from soils high in lime. Soils good for crops are dominant (table 46); only about 5 percent of the association is not suited to crops because it is poorly drained.

Although the soils are subject to periodic flooding, they are well suited to corn, oats, and alfalfa and other hay crops. Little lime is required, even for legumes. Generally, moderate amounts of phosphate and potash are needed. For high yields of alfalfa, however, additional potash may be required. This can be supplied by applications of commercial fertilizer or manure. The content of organic matter and nitrogen can be maintained in the soils by growing legumes in the sod and applying manure where corn is grown. To prevent scouring, the soils need a cover of winter crops and the streambanks need protection.

Petoskey-Kars

In this association are dominantly well drained, medium textured to moderately coarse textured soils on glacial outwash, beaches, and glacial lake deltas. The percentages of the soils in the association are approximately as follows:

Petoskey	30 to 55	Nellis, ledgy	5 to 15
Kars	15 to 25	Galen	0 to 10

All of the soils, except the Galen, are well drained; the Galen is moderately well drained. The Petoskey have formed on alkaline sands derived from shale, sandstone, limestone, and crystalline Adirondack rocks. The Kars have formed on gravelly outwash and deltaic deposits. Some areas of Petoskey soils are nearly level to moderately sloping and are excellent for crops. Most of the Kars, however, have irregular relief with moderate to steep slopes. The areas of this association are mainly on deltas on the first limestone escarpment west of the Black River. Soils good for crops are dominant (table 46). Only about 25 percent of the soils in the association are too steep to till or have limestone outcrops that make them unsuited to crops.

The soils are excellent for alfalfa and other deep-rooted legumes. Their requirement for lime is medium to low, but to get high yields both potash and phosphate are needed. Legumes can be seeded with the hay crops and manure applied to maintain organic matter and the supply of plant nutrients in the soils. If the areas are used for small grains and corn, contour tillage and broad stripcropping, where feasible, are needed to control runoff.

Podunk-Ondawa-Saco

In this association are dominantly medium textured to moderately coarse textured soils on glacial outwash, beaches, and recent alluvium. The percentages of the soils in the association are approximately as follows:

Podunk	30 to 40	Saco	15 to 25
Ondawa	15 to 30	Rumney	10 to 20

The Ondawa are the well drained soils of the association, and the Podunk are dominantly moderately well drained. The Rumney are poorly drained to somewhat poorly drained, and the Saco are very poorly drained. This association occurs on the bottom lands of the Black River. Soils fair for crops are dominant (table 46).

Although there are some better drained soils in these bottom-land areas, all the soils are flooded every spring and during some summers. Few farms are entirely within this association. Farmers generally use the areas for hay and pasture and grow small grains and row crops on adjacent higher lying soils. The meadows within the association consist mainly of timothy and native grasses. The soils are strongly acid, low in fertility, and deficient in both nitrogen and potassium. Improvement of the soils is difficult because of the frequent flooding and severe scouring on unprotected areas. On the higher lying areas, however, it would be practical to apply commercial fertilizer after the floods have receded in the spring.

Sloan-Wayland

In this association are dominantly somewhat poorly drained to very poorly drained, medium textured to moderately coarse textured soils on glacial outwash, beaches, and recent alluvium. The percentages of the soils in the association are approximately as follows:

Sloan	25 to 50	Wallkill	10 to 20
Wayland	10 to 20	Peat and muck	10 to 15

The Wayland are poorly drained to somewhat poorly drained, and the other soils in the association are very poorly drained. This association is in the north to central part of the area west of the Black River. The soils have been saturated by water flowing across the limestone regions to the west. Except that they are alkaline, they are similar to the alluvial soils that occur on the east side of the Black River. Soils poor for crops are dominant (table 46).

About half of the association is potential cropland, but because of poor drainage little is used except for pasture. Hay is mowed from some of the swamp areas. The swamp areas are flooded annually and remain too wet for grazing until June. Even when the surface water is gone, the ground-water level is close to the surface.

Saco-Rumney

In this association are medium textured to moderately coarse textured soils on glacial outwash, beaches, and recent alluvium. The percentages of the soils in the association are approximately as follows:

Saco	35 to 50	Wallkill	5 to 10
Rumney	20 to 30	Peat and muck	5 to 10
Podunk	10 to 20		

The Saco, Wallkill, and Peat and muck are the very poorly drained soils of the association. The Rumney are poorly drained to somewhat poorly drained, and the Podunk are moderately well drained to somewhat poorly drained. The association occurs on wet bottom lands on both sides of the Black River in the north to central part of the valley. The drainage is similar to that of the Sloan-Wayland association, but these soils are strongly acid. Soils poor for crops are dominant (table 46).

About half of the association consists of potential cropland, but only the Rumney and Podunk soils can now be used. The other soils are permanently wet. The soils all need lime, phosphate, and potash. In some places along the bank of the river, the soils form a natural dike. Here, the areas are drier and produce some hay for mowing. The wet areas are in pasture, and in some places swamp hay is harvested in August.

Colosse

In this association are dominantly coarse textured soils on gravel or sand. The percentages of the soils in the association are approximately as follows:

Colosse	65 to 100	Worth	0 to 15

The Colosse soils are dominantly well drained, but their drainage ranges to excessive. The Worth soils are well drained. The soils are cobbly in most places, but there are a few areas of gravelly fine sandy loam that are nearly free of stones. This association occurs mainly along the east branch of Fish Creek and the Salmon River in the southwestern part of the county. It also occurs in small areas on Tug Hill Plateau. The topography is rough in many places. Although the areas of gravelly fine sandy loam are well suited to crops, the association consists mainly of soils poor for crops (table 46).

The soils in this association are extremely acid and have a low water-holding capacity. They are low in phosphorus and potassium. If used for crops, they need heavy applications of lime and commercial fertilizer to produce good yields. A few part-time farms and farms on which the products are grown mainly for home use are scattered throughout the area, but forestry is the main industry.

Bonaparte

In this association are dominantly coarse textured soils on gravel or sand. The percentages of the soils in the association are approximately as follows:

Bonaparte	80 to 90	Colton	0 to 5
Rockland, gneiss	5 to 10		

The soils are dominantly well drained to somewhat excessively drained. They are droughty and have a high content of calcite crystals derived from adjacent outcrops of marble. Included in the association are rock outcrops of both marble and gneiss. The association is not extensive. It occurs only in the town of Diana. Soils poor for crops are dominant (table 46).

Near Remington Corners there are some farms on which the products are grown mainly for home use, and some part-time farms. Generally, however, the areas are not used for agriculture. The lack of available moisture limits the growth of crops. The soils have a neutral surface layer and a calcareous subsoil. They are low in potassium and phosphorus.

Hinckley

This association is dominated by coarse-textured soils on gravel or sand. The percentages of the soils in the association are approximately as follows:

Hinckley	80 to 90	Colton	5 to 10

The soils are well drained, but their drainage ranges to excessive. Rock outcrops, mainly of Adirondack gneiss, occur in many places. The association is in the vicinity of Diana Center and Harrisville. Soils poor for crops are dominant (table 46).

The soils in this association are generally not used for farming. There are some part-time farms, however, and some on which the products are grown mainly for home use. The soils have a low water-holding capacity, and the lack of available moisture limits the growth of crops. The upper part of the Hinckley soils and the entire profile of the Colton soils are strongly acid, but the Hinckley soils have an alkaline substratum. The soils are low in phosphorus and potassium. Alfalfa is the legume to which they are best suited, but it requires lime for best growth. If the soils are used for crops, practices are needed to maintain the supply of plant nutrients.

Adams-Colton

This association is dominated by coarse-textured soils on gravel or sand. The percentages of the soils in the association are approximately as follows:

Adams	60 to 75	Colton	20 to 25

The soils of this association are well drained, but their drainage ranges to excessive. They have formed on deltaic deposits of fine and very fine sands. The soils consist of deep, loamy fine sand made up mainly of quartz. They are strongly acid, are low in plant nutrients, and have a low water-holding capacity. Except for areas that are easily accessible and areas along improved roads, the soils are not used for agriculture. Soils poor for crops are dominant (table 46).

The soils are easily shifted by wind and must be protected to prevent blowouts from forming. Most of the blown-out areas in the sandy soils east of the Black River are on Adams soils from which the forest cover has been removed. If these soils are used for crops, they require lime and need practices to maintain the supply of plant nutrients. They will need to be protected from wind, particularly during the spring and winter.

Croghan-Adams

In this association are dominantly coarse textured soils on gravel or sand. The percentages of the soils in the association are approximately as follows:

Croghan	40 to 60	Colton	5 to 15
Adams	15 to 25	Walpole	5 to 10
Saugatuck	10 to 15		

The Croghan soils are moderately well drained, and the Adams soils are well drained. The Saugatuck are dominantly poorly drained. The minor soils of the association are the well-drained Colton and the poorly drained Walpole. The association has nearly level to moderately rolling relief. It occurs mainly on the first bench above the bottom lands of the Black River. The areas are on both sides of the river, mainly between Beaver Falls and Lowville. Soils poor for crops are dominant (table 46).

The soils of this association are very strongly acid, low in plant nutrients, and low in water-holding capacity. If they are farmed, they are used for oats, hay, and pasture. Yields are low. The soils need heavy applications of lime and a complete fertilizer for fair yields.

Colton

This association is dominated by coarse-textured soils on gravel or sand. The percentages of the soils in the association are approximately as follows:

Colton	40 to 70	Saugatuck	5 to 10
Duane	10 to 20	Rockland, gneiss	5 to 10
Adams	5 to 15		

The Colton soils are well drained, but their drainage ranges to excessive. Their texture is loamy sand, and they are gravelly or cobbly. The Duane are moderately well drained soils and occur mainly on areas near the Black River. Occupying smaller areas in the association are the well-drained Adams, the poorly drained Saugatuck, and Rockland, gneiss. The association is mostly on the east side of the Black River between the river and the foothills of the Adirondacks. It extends almost the full length of the county in a belt 2 to 6 miles wide. Soils poor for crops are dominant (table 46).

About 50 percent of this association has relief that is favorable for crops. The soils, however, are strongly acid and are very droughty and low in plant nutrients. Much of the association has been cleared, but little has been used for crops. Most of it is idle or has been abandoned and is being reforested.

Colton-Adams-Gloucester

This association is dominated by coarse-textured soils on gravel or sand. The percentages of the soils in the association are approximately as follows:

Colton	40 to 60	Gloucester	15 to 25
Adams	30 to 40	Rockland, gneiss	10 to 20

These soils occur in rough areas on moraines. They are cobbly or stony and have many outcrops of rock. The areas lie west of the Colton association and are generally adjacent to it. Soils poor for crops are dominant (table 46).

The soils in this association are strongly acid and are droughty and low in plant nutrients. In many places they occupy steep slopes. The areas are best used for recreational purposes and for forest.

Saugatuck-Croghan

This association is dominated by coarse-textured soils on gravel or sand. The percentages of the soils in the association are approximately as follows:

Saugatuck	45 to 65	Walpole	5 to 15
Croghan	20 to 30	Colton	5 to 10

The Saugatuck are poorly drained, and the Croghan are moderately well drained, but the drainage in the soils of both series ranges to somewhat poor. The poorly drained Walpole and the well-drained Colton are minor soils in the association. This association occurs on the east side of the Black River and in the same general areas as the Croghan-Adams association. The areas are flat and are on the first level above the bottom lands of the river. About 50 percent of the areas are potential cropland, but soils poor for crops are dominant (table 46).

The soils in this association are strongly acid and are low in plant nutrients. They require lime, and the supply of plant nutrients needs to be increased and maintained. Where drainage has been improved by ditching, the areas are used for growing hay or for pasture.

Scarboro-Duane

This association is dominated by coarse-textured soils on gravel or sand. The percentages of the soils in the association are approximately as follows:

Scarboro	40 to 50	Colton	5 to 10
Duane	30 to 40	Adams	5 to 10
Walpole	10 to 20		

The Scarboro are the very poorly drained, the Duane are the moderately well drained, and the Walpole are the poorly drained soils of the association. The well-drained Colton and Adams are minor soils. This association occurs on the west side of the Black River and occupies positions just above the flood plain of the river. Soils poor for crops are dominant (table 46).

The soils are strongly acid and are low in plant nutrients. About 25 to 30 percent is potential cropland, but little is now used for crops. The areas that are not idle or brushy are used for pasture.

Hudson-Rhinebeck

In this association are medium-textured to fine-textured soils on glacial lake sediments. The percentages of the soils in the association are approximately as follows:

Hudson	35 to 50	Hartland	0 to 5
Rhinebeck	30 to 50	Buxton	0 to 5
Madalin	5 to 15		

The well drained Hudson and the somewhat poorly drained to moderately well drained Rhinebeck make up much of this association. The poorly drained to very poorly drained Madalin, the well drained Hartland, and the moderately well drained to poorly drained Buxton are minor soils. The sediments in which the soils formed were derived from shale and limestone. The soils are mainly in the area between the first limestone escarpment and the Black River, in the vicinity of Lowville and in the town of Leyden. Soils good for crops are dominant (table 46).

The soils all have a low requirement for lime and potassium but need phosphorus. They are well suited to the crops commonly grown in the county. Alfalfa grows well on the Hudson soil. Birdsfoot trefoil is better suited to the somewhat poorly drained Rhinebeck soils. Practices are needed to maintain the supply of plant nutrients and to increase the supply of organic matter, particularly in the Rhinebeck soils.

Management practices are needed to control runoff and erosion because the soils are highly erodible, even on the gentle slopes. If the soils are used for crops, the best rotation is one that consists of growing row crops for 1 year followed by sod-forming crops for as long a period as feasible. Cover crops are needed on the areas during winter and early in spring.

Hartland-Buxton

In this association are medium-textured to fine-textured soils that are dominantly well drained or moderately well drained. The soils have formed on glacial lake sediments derived from crystalline rocks. The percentages of the soils in the association are approximately as follows:

Hartland	30 to 45	Adams	0 to 10
Buxton	25 to 40	Scantic	0 to 5

The Hartland and Adams soils are well drained, the Buxton are moderately well drained, and the Scantic are poorly drained. The soils are mainly east of the Black River, but the areas occur on both sides of the river. The relief is gently to strongly rolling. Soils good for crops are dominant (table 46).

The Hartland and Adams soils are acid throughout, but the Buxton and Scantic are acid in the upper part and neutral in the substratum. The soils are low in phosphorus and have a low to medium supply of potassium. They are better suited to birdsfoot trefoil than alfalfa, and more trefoil is grown. If enough lime is added, the Hartland and Adams soils are suited to alfalfa. The soils erode easily so that practices are required to control erosion. Cover crops are needed on the areas during winter and early in spring.

Scantic-Buxton

In this association are dominantly poorly drained to somewhat poorly drained, medium-textured to fine-textured soils on glacial lake sediments. The percentages of the soils in the association are approximately as follows:

Scantic	40 to 60	Suffield	10 to 20
Buxton	25 to 40	Biddeford	0 to 10

The Scantic are poorly drained, and the Buxton are moderately well drained, but the drainage in both series ranges to somewhat poor. The Suffield are well drained, and the Biddeford are very poorly drained. Relief ranges from nearly level in the poorly drained areas to slightly undulating in the better drained areas. The very poorly drained soils are in swales and depressions. Some small sandy areas and some rock outcrops occur. The association is on both sides of the Black River, mainly in the towns of Croghan and Denmark. Soils good for crops are dominant (table 46).

If the soils are used for crops, ditches are needed to provide drainage. When sufficiently drained, the Scantic soils are suitable for hay and oats and are productive. All the soils need lime for legumes. They are low in phosphorus and have a medium to high ability to supply potassium. Only the well-drained areas are suited to alfalfa, but birdsfoot trefoil grows well under good management. The principal management needs are to improve drainage by properly constructed ditches and to maintain the supply of organic matter and plant nutrients.

Swanton-Whately

In this association are medium-textured to fine-textured soils that are dominantly poorly drained to somewhat poorly drained. The soils have formed on glacial lake sediments. The percentages of the soils in the association are approximately as follows:

Swanton	40 to 50	Scantic	10 to 20
Whately	20 to 30	Peat and muck	10 to 15

The Swanton and Scantic soils are poorly drained to somewhat poorly drained, and the Whately and Peat and muck are very poorly drained. Although the Scantic soils have the same drainage as the Swanton, they have a heavier texture. The association occurs on flats and swales east of the Black River in the town of Croghan. Soils poor for crops are dominant (table 46).

About 50 percent of this association is potential cropland, but much of it needs to be drained before it can be used for crops. The areas that are cultivated are used for hay and pasture. They are too wet for alfalfa, but birdsfoot trefoil and ladino clover grow well. All of the soils have moderately acid upper layers, but their subsoil is neutral. The principal management needs are adequate drainage and maintenance of plant nutrients.

Rockland, Gneiss and Granite

This association is dominated by rockland and by very shallow soils. Rockland, gneiss, makes up about 25 to 60 percent of the association, and rock outcrops, with intervening areas of Hermon, Ridgebury, and Whitman soils, makes up a like amount. Most of the association is in the northwestern part of the county near Croghan. It consists of soils unsuitable for crops and mainly in forest (table 46). The areas that are surrounded by soils suitable for agriculture, however, are used as permanent pasture.

Rockland, Limestone

This association is dominated by rockland and by very shallow soils. It occurs on ledges and exposed rock on the west side of the Black River in the limestone area between the river and the Tug Hill Plateau. Between 60 and 80 percent of the association is made up of Rockland, limestone. The areas between the ledges are made up of Nellis and Amenia soils. They furnish some grazing early in spring when precipitation has been heavy, but they are unsuitable for crops and are mainly in forest (table 46).

Peat and Muck

This association is made up of areas of undifferentiated peat and muck. About 75 percent of it is Peat and muck, deep, and about 25 percent is Peat and muck, shallow. Most of the areas are in the western part of the county in the forested part of the Tug Hill Plateau. The areas in the eastern part of the county occur mainly around the small lakes that are scattered throughout the area. All of the areas have a cover of marsh and swamp vegetation or are in forest (table 46).

Forestry

About 67 percent of the land area in Lewis County, or 558,700 acres, is in forest. About 7 percent, or 60,000 acres, is classed as nonproductive (*1*). Except for the woodland in farms, the forests are concentrated in two large areas. One occupies the more remote part of the Tug Hill Plateau in the southwestern part of the county; the other, which is part of the Adirondack forest, extends along the eastern border. Most of the forested areas were not mapped in detail but were mapped by reconnaissance.

Forests are important in the economy of Lewis County. They provide cash income on the farms and give employment during the winter. According to a survey made by the State College of Forestry (*1*), about 6,700,000 cubic feet of timber was harvested in 1950. About one-half of this was harvested from farm woodlots, and much of this was used on the farms as fuel or for fence posts or lumber.

About 40 percent of the timber harvested by farmers was converted to pulp in the papermills or to lumber in the sawmills. More than 55,000 gallons of maple sirup was produced in 1951. Most of this was sold to out-of-State processors.

The harvesting of wood, manufacturing of wood products, and services to those who seek recreation in the forests provide much of the nonagricultural employment in the county. In 1950, there were 20 sawmills operating in the county. In addition, there were 11 other wood-using plants, and at these, 3 times as much wood was processed as was used by the farmers and sawmills combined. These plants included 4 pulp and papermills, veneermills, and manufacturers of items including shoe lasts, bowling pins, caskets, cheeseboxes, and plugs for paper rolls. Of the 10 million cubic feet of wood used in the county, almost 7 million came from the forests of Lewis County.

Northern hardwoods and spruce-fir types are the main kinds of trees in Lewis County. In the hardwood forests hard maple and yellow birch are dominant, but beech, red maple, and elm make up much of the stands; the minor species are black cherry, white ash, and basswood. In the spruce-fir forests, red spruce and balsam are dominant, and the stands include some tamarack and hemlock. On the wet flatlands, along the Black River north of Lowville and through the central and northern parts of the county, gray birch and aspen have encroached since the original forests were cut. These two species have also taken over abandoned farmlands on the wet and moderately wet, strongly acid, light-textured soils on the east side of the river. In addition, patches of these trees have grown up in all other parts of the county east of the river. The economic value of such forests is low.

About 6 percent of the county, or nearly 50,000 acres, is classed as idle land. This acreage is increasing as additional areas, formerly used for agriculture, are abandoned. After an area has been abandoned, it reverts to brush and trees of low quality.

The reforesting of idle and abandoned land has been carried on for a number of years. According to the survey made by the State College of Forestry (*1*), 29,000 acres of trees had been planted in the county by 1950. Most of these were planted on abandoned farms around the outer edge of the Tug Hill Plateau and on the sand plain east of the Black River. White pine, red pine, and Scots pine were the principal species used, but larch, white spruce, Norway spruce, and whitecedar were also planted. Most of the seedlings used for planting were grown in the forest-tree nursery of the New York State Conservation Department, located on the sandy terrace east of Lowville.

The same survey indicates that, although in the county as a whole the total growth of trees is greater than the amount used and destroyed, trees are being cut for pulpwood and sawtimber much faster than they are being replaced. The growth rate of trees 6 inches in diameter and larger is only 31 cubic feet per acre over the productive forest area. The number of less desirable trees is increasing, and as a result the value of the forests is decreasing. Part of the low rate of growth has been caused by understocking, and part, by the limitations of the soils. The suitability of the various soils for planting trees is discussed under the management groups in the section, Management of the Soils. There is, however, little exact information on the growth rates expected from trees on individual soils or on the detailed effects of management.

Good forest management requires that the potential productivity of the soils and their suitability for various kinds of trees be recognized. On the most productive forest sites, trees grow 3 to 4 times faster than on the poorest. The effort required to maintain desirable species that are suited to the soil varies greatly with the soil. In many places, for example, stands of spruce and fir can be maintained on poorly drained or very poorly drained soils, such as the Westbury and Tughill or the Ridgebury and Whitman. If spruce and fir are grown on well drained and moderately well drained soils, however, in the same areas as hardwood trees, they cannot stand the competition from the hardwood trees. Similarly, sugar maple and yellow birch are the hardwoods that grow best on the strongly acid soils, but white ash and basswood grow rapidly on lime-influenced soils, such as the Alden, Amenia, Dover, and Manheim.

The soil associations of this county have been placed in 12 geographic groups that reflect broad differences in the composition of the forests and in management. The location of these 12 forest groups is shown in figure 2. The percentage indicated for each soil association is estimated and shows the proportion of the association in forest.

Forest Group 1

The soils in this group lie between the valley of the Black River and the Tug Hill escarpment. They form a belt that runs through the center of the county. Productive soils are dominant in the group. The soils are used mostly for farming. Little remains of the original hardwood forest of sugar maple, beech, yellow birch, basswood, white ash, elm, and butternut that once dominated the well-drained soils that are now used for agriculture. The soil associations that make up this group are:

		Percent in forest			*Percent in forest*
(GS)	Gloucester-Ridgebury	32	(K)	Kars	6
(HH)	Herkimer-Houseville	6	(NA)	Nellis-Amenia	7
(H)	Howard	4	(PK)	Petoskey-Kars	10
			(PM)	Poland-Mohawk-Manheim	16

The small tracts now in woodlots and sugar bushes usually occupy the less well drained soils and ledgy areas. Except for the soils limited by poor drainage or depth to bedrock, the soils of this group are the most productive of hardwoods in the county. Sugar maple, white ash, and basswood grow well, and where they occur they can be favored. The chief management problems arise from past treatment, especially grazing and repeated cutting of the most desirable trees.

The forest on the very poorly drained soils—the Lyons, Westland, and Fonda—frequently is whitecedar, perhaps the most valuable crop that can be grown without drainage. On the poorly drained Kendaia, Glenfield, and Ilion soils, and in places on the very poorly drained soils as well, the forest contains a high proportion of elm and black ash, in many places mixed with other hardwoods and cedar.

The potential growth rate on the poorly drained and very poorly drained soils ranges from low to medium, according to the degree of drainage, but the present rate of growth is often very low because of mismanagement and understocking. The lack of seed trees of valuable species

and the heavy growth of herbaceous species on these wet, fertile soils are obstacles to improved management.

Forest Group 2

In this group are well-drained to poorly drained, limestone soils that occur only on the west side of the Black River. They are dominantly shallow or ledgy. Their low moisture-holding capacity is offset to some extent by their position on easterly slopes. In the group are some shallow soils in depressions; these are normally wet but dry out during short periods of drought. The soil associations in this group are:

	Percent in forest		*Percent in forest*
(NK) Nellis-Kendaia	28	(RL) Rockland, limestone	60
(NS) Nellis-Amenia, shallow	7		

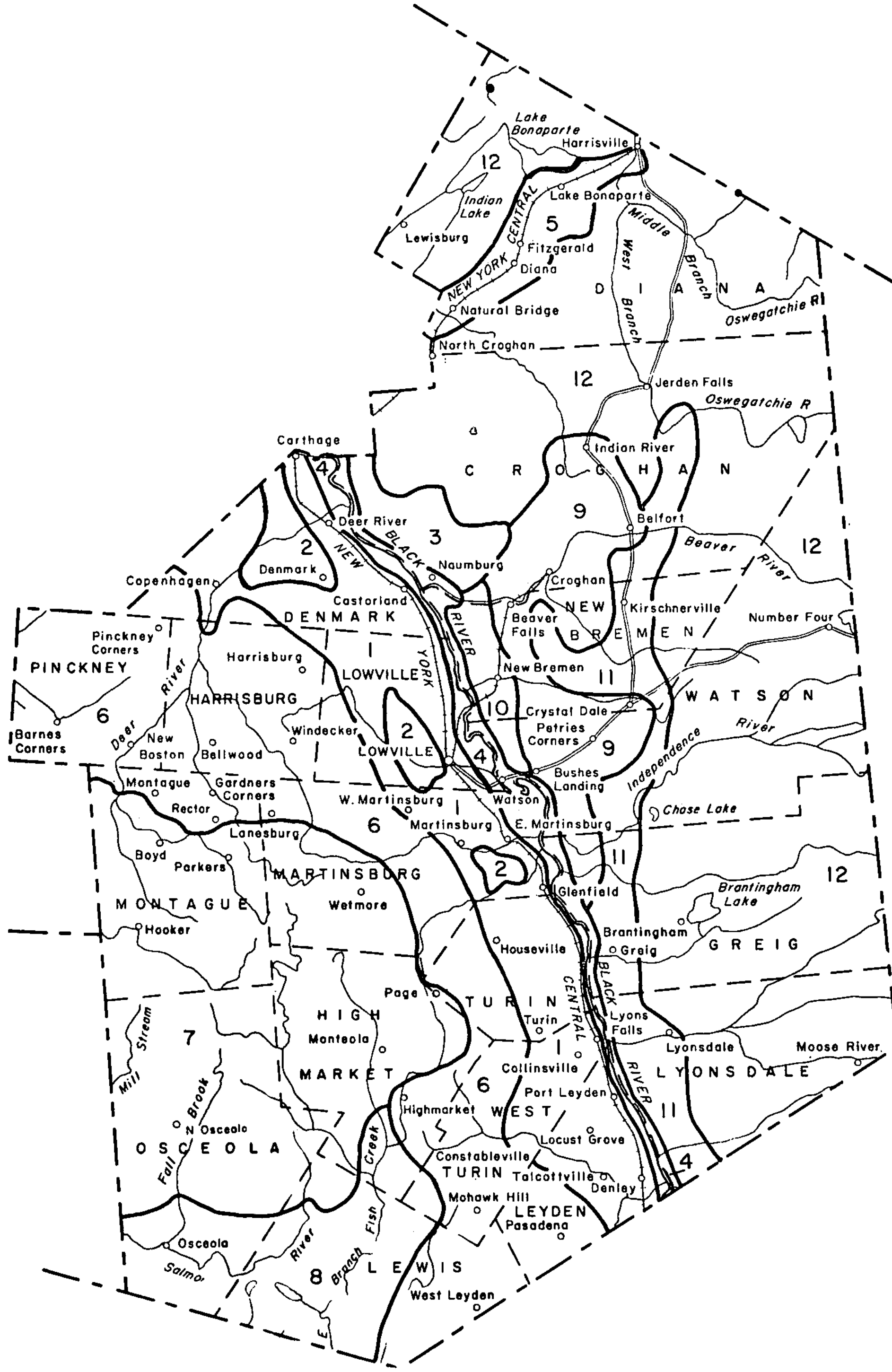

***Figure 2.*—Map showing the general forest groups of soils in Lewis County. The numbers refer to forest groups discussed in the report.**

Most of the soils in this group are in permanent pasture. The woodlands that make up about one-fifth of the acreage are mainly unproductive because the soils are of limited depth and are understocked. On the somewhat deeper soils and in the deep pockets in the ledgy areas are good sugar bushes and woodlots similar to those in group 1.

On the wet areas the original forest seems to have consisted of extensive thickets of whitecedar, and some elm, hemlock, and soft maple. The deeper areas of the better drained soils had a hardwood forest of beech and maple in which there was a large proportion of basswood, white ash, and elm. On the shallowest soils the forests were stunted and sparse. Some of the wet areas still have remnants of the original cedar thickets.

The potential growth rate for this forest group ranges from very low to medium, depending on the depth of soil available for the roots of trees. The principal management problems on all except the droughty and very poorly drained areas are the result of long-continued grazing and the resulting poor condition of the growing stock. In the shallowest areas, where roots must spread out near the surface, grazing is particularly injurious.

Forest Group 3

In this group are lake-deposited soils on second bottoms adjacent to the Black River. Almost all of the areas have been cleared; the cleared areas that are not wet are good farmland. The existing forest and idle lands are chiefly in wet areas. The soil associations in this group are:

	Percent in forest		Percent in forest
(HB) Hartland-Buxton	11	(SB) Scantic-Buxton	3
(HR) Hudson-Rhinebeck	5	(WS) Swanton-Whately	0

The remnants of forest are mostly in poor condition, and their requirements are similar to forest on the poorly drained soils in group 1.

Forest Group 4

In this group are soils of the flood plains that border the Black River and its major tributaries. All the soils are flooded frequently, and the wettest are flooded almost annually. The soil associations in this group are:

	Percent in forest		Percent in forest
(GE) Genesee-Eel	3	(SW) Sloan-Wayland	17
(PO) Podunk-Ondawa-Saco	4	(SR) Saco-Rumney	3

Most of the soils of this group have been cleared and are used mainly for agriculture. The original forest varied according to the frequency of flooding, drainage, and the amount of lime in the soils.

On the Sloan and Wayland soils and on the associated Peat and muck on the west side of the river, black ash and alder swamps were prominent. Cedar swamps were also common on the Wayland soils.

The poorly drained, alkaline soils on the western side of the Black River, such as those associated with the Genesee and Eel, had mixed forests of pine, ash, cedar, beech, and soft maple. On the acid Rumney and Saco soils on the eastern side of the river, cedar and ash were lacking and the hemlock was more abundant. The well drained and moderately well drained soils high in lime—Genesee and Eel—had a rich hardwood forest. There were a few open intervales on the Genesee and Eel soils. One large intervale was near the mouth of the Deer River.

The soils that are flooded too frequently for forest have a cover of swamp grasses and willows. Other wet soils have a forest consisting of elm, willow, red maple, and beech. The productivity of these wet areas is extremely low because of understocking and lack of desirable species, and the potential growth rate is low to medium.

Forest Group 5

The soils of this group occupy a small acreage within the town of Diana, where the Grenville crystalline limestones are mixed with igneous rock. The soil associations that make up this group are:

	Percent in forest		Percent in forest
(B) Bonaparte	25	(HA) Hinckley	25
(DA) Dover-Amenia	35		

Because of variations in bedrock and relief, the soils in this group vary sharply within short distances. Large exposures of igneous rock, of shallow Gloucester soils over igneous rock, and of shallow soils over crystalline limestone are included. The soils of the Hinckley association of this group have an alkaline substratum.

The original forest cover on the deeper soils was northern hardwoods, and on the lime-influenced areas it included black cherry, basswood, and ash. On the poorly drained soils and on peats high in lime, there were cedar swamps, some of which still persist. The shallow soils and the soils intermediate in drainage had a forest cover consisting of several species, including pine and hemlock.

The present forest has been much affected by cultivation, grazing, and fire. Remnants of the original forest persist in woodlots. Pioneer hardwoods, aspen, gray birch, red maple and, where seed sources are nearby, white pine and balsam are encroaching on the idle fields and pastures. In some places whitecedars have spread onto well-drained soils that are high in crystalline limestone.

The productivity of the soils for hardwoods varies. Soils more than 3 feet deep to bedrock and influenced by lime have a high potential. In places there are shallower soils overlying fissured limestone that have nearly as high productivity as the deeper soils. The acid and coarse-textured soils have lower productivity than the others. The productivity of the shallow soils in rockland areas is very low.

Because of stoniness or relief, many deep, well-drained soils sufficiently fertile for agriculture have been abandoned. These deserve primary attention in any reforestation efforts.

Forest Group 6

The soils in this large group form a broad arc around the northward slopes and eastern escarpment of Tug Hill. Except at the outer margins, the elevations are chiefly between 1,400 and 1,800 feet. The soil associations of this group are:

	Percent in forest		Percent in forest
(AL) Marcy-Alden-Camroden	36	(RA) Camroden-Marcy	16
(EW) Empeyville-Worth	20	(RK) Camroden-Pinckney-Marcy	16
(KR) Pinckney-Manlius-Camroden	38	(TI) Turin-Ilion	8
(PT) Poland-Turin-Ilion	15	(WE) Worth-Empeyville-Westbury	10

The strongly acid Worth, Empeyville, and related soils are the same as those in forest group 7, but they are included here because of similarities in forest conditions.

The entire area has been largely cleared for agriculture. Remnants of the earlier forest make up less than 15 percent of the area and are usually on steep, wet, or stony soils. Continued abandonment, followed by reforestation and natural restocking, is now greatly increasing the proportion of land in forest.

Marked variations in the drainage and acidity of the upper layers greatly influence growth of trees on the soils of this group. The shale and sandstone till underlying soils of this group contains some lime, especially in the northern part. As a result, all the poorly drained soils except those in the Worth and Empeyville associations are often neutral or only slightly acid. In contrast, the well-drained soils are more strongly acid.

Except for the Manlius soils and for the soils in a few areas of the Worth and Empeyville associations, the mantle of soil is generally deep. Rooting of trees is usually limited by poor drainage or by fragipans rather than by the underlying rock.

In the original forest the northern hardwoods—sugar maple, beech, and yellow birch—occupied the whole area. Elm, basswood, ash, and butternut formed a prominent admixture on the soils of much of the Camroden-Pinckney-Marcy, the Poland-Turin-Ilion, and other associations that have a higher content of lime than the soils of the other associations. Hemlock was common on the wetter soils. In the Empeyville-Worth and the Worth-Empeyville-Westbury associations, hemlock often grew in mixture with red spruce.

Under suitable management the present woodlands vary greatly in quality and in potential productivity. The shallow Manlius soils and the strongly acid Worth and Empeyville soils are low to medium in productivity for hardwoods. Conifers are moderately productive, however, and should be encouraged wherever there is a source of seed.

The poorly drained and very poorly drained Westbury and Tughill soils are well suited to spruce and fir, but hardwoods other than yellow birch and red maple grow poorly.

The remaining well-drained soils, together with the somewhat poorly drained to poorly drained soils high in lime, have moderate to high potential productivity for northern hardwoods and hemlock. The Poland, Turin, Camroden, Ilion, and Marcy soils are suitable for ash and basswood.

The concentration of State reforestation areas on the soils of this forest group reflects the widespread abandonment of farmland, especially at the higher elevations. Continuing abandonment leaves large tracts for which the alternatives are natural restocking or reforestation. The important considerations in selecting species for planting are soil drainage and variations in acidity of the surface soil.

Forest Group 7

The soils of this group cover a large part of the central Tug Hill Plateau and are chiefly at elevations of 1,500 to 2,000 feet. They are almost entirely in forest, as contrasted to the cleared lands of group 6 to the north and group 8 to the south. The soil associations of this group are:

		Percent in forest
(BU)	Westbury-Tughill-Empeyville	90
(EB)	Empeyville-Westbury-Worth	95
(EW)	Empeyville-Worth	20
(P)	Peat and muck	45

The smooth relief on the top of the plateau favored development of large areas of swamps and of poorly drained soils. The unfavorable soils, high snowfall, and lack of roads make this the least known area in the State. Until recently much of the forest has not been cut heavily. In 1951, the 5 towns in which the soils of this group occur contained 45 percent of the board-foot volume in the entire county. Because the area is not accessible, the soils are mapped only in associations.

On the better drained Worth and Empeyville soils, the original forest was mixed conifers and hardwoods—yellow birch, beech, red and sugar maples, red spruce, and hemlock. The wetter Westbury and Tughill soils were dominated by conifers, especially by red spruce, and by red maple and yellow birch. Some areas of Tughill soils and the more favorable peats were often spruce-fir swamps. Large, open swamps and beaver meadows were mentioned in the earliest reports, and many of these remain treeless.

The Worth and Empeyville soils once had a high proportion of conifers. In many of these areas, the forests now are dominantly hardwoods, because of logging or natural destruction of conifers.

Though this forest group is noted for the high-quality yellow birch logs that have been cut in recent years, hardwoods grow slowly on these infertile soils. For example, mature hardwoods reach a height of only about 65 to 70 feet on the Worth soils. Spruce and balsam on the Worth soils, however, attain a mature height of 85 to 90 feet, which corresponds to a site index of about 70 (height at age of 65 years).

On the Westbury soils the mature heights of the spruce in the spruce-yellow birch forest type is 65 to 70 feet. On an Empeyville soil, a typical old-field stand of balsam had a site index of approximately 60.

From the foregoing it is apparent that even the better drained soils of this group have relatively low productivity for hardwoods, although after logging, these hardwoods compete strongly with the conifers. The slow growth and low quality of the hardwoods on the cutover Worth and Empeyville soils are major problems in forest management.

The soils of this group are free of boulders but are very stony in many places. The Worth and Empeyville soils provide the best-drained locations for roads and usually provide an excellent base. The Tughill soils are least suitable because they remain wet. For roads, the Westbury are intermediate between the Empeyville and the Tughill soils. Ridges in areas of Worth soils are good sites for borrow pits, but the material is frequently too stony for road surfacing.

Windfirmness is medium to good on the well-drained Worth soils and low on the Tughill.

Forest Group 8

The soils of this group form an irregular band less than 5 miles wide. They are near the Lewis-Oneida County

line in the valleys and near the headwaters of the Salmon River and Fish Creek. The 1,400-foot contour approximately separates the soils of this group from the soils on the higher, central part of Tug Hill. The soil associations of this group are:

	Percent in forest		Percent in forest
(BU) Westbury-Tughill-Empeyville	90	(O) Colosse	45
(EW) Empeyville-Worth	15	(WE) Worth-Empeyville-Westbury	10

The extensive Colosse soils of group 8 have formed on glacial outwash and range from coarse, cobbly deposits to fine sandy loams. The Worth and Empeyville soils here tend to be less strongly acid than the same soils at higher elevations. The morainic areas of Worth and Empeyville soils lack strongly developed fragipans. In addition, the forest may be influenced by the somewhat milder climate of this lower lying area.

The original vegetation on the soils of this group seems to have been northern hardwoods, but hemlock, and in a few places, spruce trees were abundant on the poorly drained soils and at higher elevations. A commentary by James Constable, made in 1805, referred to the large amount of hemlock and a change to "better timber, ash, bass, etc." on better soils near the upper Salmon River.

The makeup of the present forest has been affected by continued cutting and by fire. In many places, except in swamps and on poorly drained soils, fire has eliminated the spruce and hemlock.

The Colosse fine sandy loams and the morainic or less acid areas of the Worth and Empeyville soils are generally medium in productivity for hardwoods but are occasionally higher. The growth of hardwoods is somewhat poorer on the more typical Worth and Empeyville soils and on the remaining soils of this group.

The Colosse soils and the morainic areas of the Worth soils provide excellent bases for roads and are good sources of borrow or surfacing materials. In suitability for roads, the remaining soils of this group are like the soils of group 7.

The trees on the Colosse soils and on the morainic areas of the Worth soils have relatively high windfirmness. The trees on the other soils of the group have windfirmness like those of group 7.

Forest Group 9

The several separate areas of soils in this group are between the Black River and the sand terraces of forest group 10. These areas range chiefly from Bushes Landing northward to Indian River. The soil associations in this group are:

	Percent in forest		Percent in forest
(ES) Essex-Scituate	30	(RM) Rockland, gneiss and granite	25
(GR) Gloucester	30		

The soils of this group vary in depth. In many places bedrock is exposed, and in a number of places the soils are stony. The original forest seems to have been mainly northern hardwoods—sugar maple, beech, and yellow birch—with variable amounts of white pine and hemlock.

The deeper soils of the group on the smoother slopes next to the valley were cleared at an early date. Most of the other soils have now been cleared, or the forest on them has been strongly affected by cutting and grazing. About a third of the acreage is now in woodlots or swamps or has a growth of pioneer hardwoods.

Potential productivity varies from moderate to moderately high for the deeper, well drained and moderately well drained soils. On the shallow soils, it is low for hardwoods. The small areas of poorly drained and very poorly drained Ridgebury and Whitman soils often have spruce, fir, and hemlock, which are better suited to these soils than the hardwoods.

Except on the shallow soils and on exposed slopes and in the swamps, windfirmness is generally high for these soils. The soils of this forest group as a whole are accessible, but skidding and hauling are hindered by the rough topography and the closeness of bedrock to the surface.

Forest Group 10

The soils of this group occur in the valley of the Black River at elevations below 800 feet. They are moderately well drained to poorly drained, acid sands that occur in association with some soils on coarse till. The soil associations are:

	Percent in forest		Percent in forest
(CA) Croghan-Adams	30	(SD) Scarboro-Duane	40
(SC) Saugatuck-Croghan	50		

The original forest appears to have been mixed hemlock-hardwood, but white pine and hemlock dominated in some places. The area was almost completely cleared, and most of it was later abandoned. At least half is now occupied by pioneer forest consisting mainly of gray birch and some aspen, black cherry, and a few groups of white pine. The remainder will restock with similar forest unless it is planted.

The existing forest is of exceedingly low value, and natural improvement will be slow. When undisturbed, these soils have medium to high productivity for conifers, but productivity decreases with loss of organic matter from the surface soil.

Forest Group 11

The soils of this group are on a great sand terrace having elevations of 1,200 to 1,400 feet. They occur along the eastern side of the Black River on irregular westward slopes of the terrace and on outwash at lower elevations. The soil associations of this group are:

	Percent in forest		Percent in forest
(A) Adams-Colton	40	(CD) Colton	45
(CAM) Colton-Adams-Gloucester	55		

The Adams-Colton association also extends eastward into the uncleared Adirondack section occupied by the soils of group 12. There, it differs in being at higher elevations and in not having been cleared.

The original forest on the soils of group 11 seems to have been dominated by mixed stands of hardwoods, hemlocks, and white pines. The northern hardwood-hemlock forest types grew on the finer textured, less acid sands, and there were many areas of the white pine or pine-hemlock forest.

At higher elevations, the forests on the poorly drained Saugatuck and Walpole soils were spruce-yellow birch or

mixed conifer types similar to those on the same soils of group 12.

To understand present forest problems, it is necessary to know some of the early history. The pine was cut fairly soon after the area was settled. After the middle of the 19th century, several large tanneries were located within or adjacent to the soils of this forest group. Each tannery had a capacity that required clearing a thousand acres or more of "hemlock land" annually. Fires burned both cutover areas and natural windfalls throughout most of the past century. In 1882, C. Hart Merriam wrote: "The dense forests that formerly covered this terrace have mostly been destroyed and it is now a sandy barren region . . . ."

Much of the level area was cultivated for a brief period, but depletion of soil fertility, frosts that destroyed crops, and disappearance of local markets brought about complete abandonment.

The present vegetation consists of second-growth and pioneer hardwood forests, conifer plantations, and shrubby and mossy old fields.

The Adams and Colton soils are low in productivity for hardwoods, and the pioneer growth on them has little value except as cover. Included with the Adams and Colton soils are many areas of less highly leached soils, which have a somewhat finer textured surface soil or contain silty layers or traces of lime in the underlying material. These included soils support northern hardwood forest of medium productivity. Forests of similar quality also occur on a few included areas of the Essex, Gloucester, and Scituate soils.

Restocking of the open land has been retarded by the very low fertility, by frost, and often by a dense growth of hardhack. Unless reforested or otherwise treated, the open land will have no immediate value for either forestry or wildlife.

The principal reason for the slow growth or failure of the conifer plantations within this group is the low fertility of the soils. Frost and insect damage are contributing causes. Because of small variations in fertility, the growth of plantations is highly irregular in some places. There may be marked contrasts in growth between depleted old fields and adjacent unplowed land. The old fields normally supply enough nitrogen for the moderate growth of pine. Lack of magnesium and potassium in the soils, however, reduces the growth or stunts the trees. Where the surface soil has been severely wind eroded, the lack of nitrogen and mineral nutrients prevents the normal growth or even the survival of planted trees. Moreover, the trees fail to establish a deep root system for many years and are subject to damage from drought. The more vigorous pines soon extend roots to depths of 6 to 12 feet in these loose sands.

Where nutrient deficiencies are not serious, plantations of red pine often grow at the rate of 1 cord per acre per year. Appreciably higher yields are possible on the finer textured or more fertile soils.

Though spruce and fir grow well on the Saugatuck and Scarboro soils, the forests on these soils have reverted to alder thickets in places.

Forest Group 12

The soils of this group are acid and coarse textured. They form a broad belt in the Adirondack foothills on the eastern side of the county and cover about a fifth of the county. The topography is irregular, and the soil mantle generally is shallow over granite and syenite bedrock. The dominant soils have formed from glacial till, but many areas of rockland, peat, and sandy or gravelly outwash are interspersed. Because the areas are almost entirely forested, the soils are known only through reconnaissance mapping. The soil associations of this group are:

		Percent in forest
(C)	Colton	45
(HBR)	Hermon-Becket-Ridgebury	85
(HBW)	Becket-Hermon-Waumbek	90
(HWR)	Hermon-Ridgebury-Rockland	85
(P)	Peat and muck	45
(RG)	Ridgebury-Gloucester-Rockland	50
(RM)	Rockland, gneiss and granite	25

The species and the proportion of each in the present forest are largely the same as those in the original forest. The proportion of softwood, however, has been reduced and, in places, almost eliminated by persistent cutting for pine sawtimber, spruce and fir pulpwood, and, formerly, hemlock tanbark. Cutting, followed by fire, has also altered the makeup in many areas; usually, the heavy coniferous forest has been replaced with pioneer stands of aspen, soft maple, and sprout hardwoods.

For purposes of present forest management, this group can be considered in four sections.

1. Upland on till.—The principal soils of this subgroup are the well drained Hermon and Becket and the moderately well drained to somewhat poorly drained Waumbek. The original forest generally was made up of a mixed stand of hardwoods and conifers consisting of yellow birch, beech, sugar maple, and a variable, but large, proportion of red spruce and, in places, hemlock. Over most of the area, cutting for softwoods has changed the stand so that the northern hardwood type (birch-beech-maple) is dominant. These soils are no more than moderately productive, and heights at maturity range from 60 to 75 feet. Nevertheless, hardwoods compete so strongly on these soils that there is little likelihood that conifers can be reestablished by measures now considered economical. Where merchantable maple and birch are cut, they are often replaced by beech.

Areas of these soils that are transitional to the Essex, Gloucester, or Scituate soils and that are more than about 18 inches deep are better suited to hardwoods than the typical soils. In places, hardwoods reach a mature height of 75 to 85 feet on these transitional soils. Here, there are more sugar maples in the stands, and they tend to reproduce better than on the other soils. Red spruce and hemlock reached their best growth in the original forests on these soils, but they were seldom able to regenerate after cutting.

The Becket, Hermon, and Waumbek soils are interlaced in many places with small patches of ledgy soils and with wet Ridgebury and Whitman soils, sometimes in combination. In these places the shallow or wet soils make up 10 to 30 percent of the areas. Stands of spruce persist where there have been no fires. After cutting, such areas restock with more than the average amounts of softwoods.

2. Rockland.—Generally, soils that are dominated by exposed ledges and talus have diverse characteristics. The steeper areas in many places have pure stands of spruce

and hemlock rooted in the thick organic layer and thin mineral soils. The density of the stand and the quality of the site vary according to the material in which the trees can root. The less steep slopes usually have an irregular surface, and ledges protrude through shallow Hermon or Waumbek soils and some pockets of deeper soils. The overall forest on the less steep areas is then a mixture of hardwoods and of spruce and hemlock.

The trees on these soils grow more slowly than trees on the deeper soils, and they have less ability to withstand high winds. Managing the forests and logging the trees are difficult because the areas are so rough and stony. Nevertheless, many unburned areas have value for forests because of the abundance of conifers and their ability to restock after logging. Severe fires destroy the organic layers of the soils. As a result, the soils become of little value and the usefulness of the watershed is decreased.

3. Sandy and gravelly outwash and poorly drained till.—These soils occur mostly on the flats that surround lakes and swamps. Some of them are on deltas, kames, or eskers, or on the small flats that occur throughout the valleys of the county. The larger flats are continuous with the sands of the terraces to the west. An example of these is the flat that surrounds Beaver Lake.

The Colton, Duane, and Saugatuck are the main soils that have formed on sandy and gravelly outwash. The dominant forest type on the Colton, Adams, and Duane soils is spruce-yellow birch. The spruce-fir or mixed conifer types are common on the poorly drained soils such as the Saugatuck. The black spruce or other swamp types occur on the very poorly drained Scarboro soils and on the peats. The spruce-yellow birch and other coniferous types, and occasionally red maple, are on the poorly drained and very poorly drained soils such as the Leicester and Whitman. In some places, especially on kames and deltas, the soils are finer textured than typical or differ from the typical soils in mineral composition. The suitability of such soils for trees is similar to that of the soils formed on till.

The sandy soils of this group are moderately productive of conifers and unproductive of most hardwoods, except white and yellow birch. Growth rates up to about 1 cord per acre per year have been measured in vigorous, young spruce-fir forest on unburned areas of Adams soil. In spite of cutting, coniferous stocking tends to remain high, and this facilitates management. Measures to favor spruce and fir are easier than on the upland till soils.

When repeated cuttings or fires reduce the stocking of conifers, young hardwoods of several species may predominate. Except for red maple and white birch, these new stands are generally of very low site quality, and aspen seldom produces pulpwood. White pine occasionally restocks the sandy soils after fire, and it grows well. Severe or repeated fires that completely remove the humus layer, however, drastically reduce the fertility and the potential growth on these soils. The wetter soils are rarely burned over as completely as the better drained soils, but they may restock to bog shrubs or alder that excludes the trees for long periods.

Except for the wetter sands and swamps, the soils of this group offer little hindrance to logging. The Adams and Colton soils are excellent for roadbuilding. Also, fill or surfacing materials can be obtained from the deltas, kames, and eskers. The Croghan and Saugatuck soils are less desirable for roads because they have a seasonal high water table. The wet soils on till—the Ridgebury and Whitman—are bouldery.

4. Very poorly drained mineral soils and peats.—These are level Scarboro and Whitman soils that grade to shallow peats. Productive black spruce or a mixed stand of conifer swamp types grow on the mineral soils and on the shallow peats. In the large areas of peat, the growth rate of black spruce often decreases sharply with distance from the edge of the adjoining mineral soils, and the center of these bogs may be open.

Little is known about the management of the swamp forest types. The trees are highly susceptible to windthrow, which limits partial cutting. In most places, however, natural regeneration is adequate after cutting. Although the growth rate of trees on these soils is low, the ease of management adds to the value of these soils.

Soil Series and Mapping Units

This section contains descriptions of all the soils mapped in Lewis County. Under the name of each soil series, a typical profile of the series is described in detail.[3] Following the description of the typical profile are listed the mapping units. Each mapping unit has a name that tells some of its own characteristics, and, in addition, it has those characteristics that are common for the soil series. If there are significant facts about a mapping unit that are not apparent from its name and the description of the series, these are mentioned following the name.

Some of the mapping units are undifferentiated soil groups made up of two or more kinds of soils. Soils are mapped as undifferentiated groups if the differences between them, especially those that affect agricultural suitability, are so slight that there is no practical advantage in mapping them separately.

The approximate acreage and the proportionate extent of the soils mapped in detail in Lewis County are shown in table 47. The great soil groups to which the soil series belong and the relationships of the soil series to parent material and to drainage are shown in table 48. Except for the Humic Gley and Low-Humic Gley, each of the great soil groups is described in the 1957 Yearbook of Agriculture (*12*). Humic Gley and Low-Humic Gley groups have been described by Thorp and Smith (*11*). The morphology and genesis of the soils of New York are discussed in Cornell Extension Bulletin 930 (*3*).

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[3] The terms for reaction given in the soil profiles as the pH value are defined as follows:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4–7.8
Very strongly acid	4.5–5.0	Moderately alkaline	7.9–8.4
Strongly acid	5.1–5.5	Strongly alkaline	8.5–9.0
Medium acid	5.6–6.0	Very strongly alkaline.	9.1 and higher.
Slightly acid	6.1–6.5		
Neutral	6.6–7.3		

TABLE 47.—*Approximate acreage and proportionate extent of the soils mapped in detail*

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Adams loamy fine sand, 0 to 3 percent slopes	1, 169	0. 3	Empeyville flaggy silt loam, 3 to 8 percent slopes	2, 622	0. 6
Adams loamy fine sand, 3 to 8 percent slopes	5, 714	1. 2	Empeyville flaggy silt loam, 8 to 15 percent slopes	361	. 1
Adams loamy fine sand, 8 to 15 percent slopes	815	. 2	Essex stony fine sandy loam, 3 to 8 percent slopes	1, 265	. 3
Adams loamy fine sand, 15 to 35 percent slopes	975	. 2	Essex stony fine sandy loam, 8 to 15 percent slopes	423	. 1
Adams loamy fine sand, 0 to 15 percent slopes, severely blown	1, 007	. 2	Essex stony fine sandy loam, 15 to 25 percent slopes	14	(1)
Adams and Colton soils, morainic, 3 to 8 percent slopes	304	. 1	Fonda silt loam, 0 to 3 percent slopes	1, 119	. 2
Adams and Colton soils, morainic, 8 to 15 percent slopes	2, 044	. 4	Fresh water marsh	194	(1)
Alden silt loam, 0 to 3 percent slopes	9, 501	2. 1	Gage silt loam, 0 to 3 percent slopes	220	(1)
Alluvial land	2, 078	. 4	Gage silt loam, 3 to 8 percent slopes	278	. 1
Amenia loam, deep, 0 to 3 percent slopes	1, 173	. 3	Gage silt loam, shallow, 0 to 8 percent slopes	68	(1)
Amenia loam, deep, 3 to 8 percent slopes	3, 748	. 8	Galen fine sandy loam, 0 to 6 percent slopes	270	. 1
Amenia loam, moderately deep, 0 to 3 percent slopes	924	. 2	Genesee silt loam, 0 to 2 percent slopes	751	. 2
Amenia loam, moderately deep, 3 to 8 percent slopes	2, 082	. 4	Genesee silt loam, alluvial fans, 0 to 3 percent slopes	141	(1)
Amenia loam, shallow, 2 to 8 percent slopes	1, 103	. 2	Glenfield silt loam, neutral, 0 to 5 percent slopes	1, 977	. 4
Biddeford silty clay loam, 0 to 2 percent slopes	1, 755	. 4	Glenfield silt loam, acid, 0 to 3 percent slopes	218	(1)
Blownout land	1, 161	. 3	Gloucester stony fine sandy loam, 3 to 8 percent slopes	819	. 2
Bonaparte gravelly sandy loam, 2 to 8 percent slopes	153	(1)	Gloucester stony fine sandy loam, 8 to 15 percent slopes	408	. 1
Bonaparte gravelly sandy loam, 8 to 15 percent slopes	53	(1)	Gloucester stony sandy loam, 3 to 8 percent slopes	3, 357	. 7
Bonaparte gravelly sandy loam, 15 to 45 percent slopes	423	. 1	Gloucester stony sandy loam, 8 to 15 percent slopes	4, 225	1. 0
Buxton silt loam, 0 to 2 percent slopes	1, 380	. 3	Gloucester stony sandy loam, 15 to 25 percent slopes	1, 081	. 2
Buxton silt loam, 2 to 6 percent slopes	974	. 2	Gloucester and Essex very stony fine sandy loams, 3 to 15 percent slopes	10, 010	2. 2
Buxton very fine sandy loam, 0 to 6 percent slopes	713	. 2	Gloucester and Essex very stony fine sandy loams, 15 to 35 percent slopes	624	. 1
Camroden silt loam, 0 to 3 percent slopes	946	. 2	Gloucester and Scituate soils, extremely stony, 3 to 35 percent slopes	6, 086	1. 3
Camroden silt loam, 3 to 8 percent slopes	26, 509	5. 7	Gloucester very stony fine sandy loam, shallow, 5 to 25 percent slopes	969	. 2
Camroden silt loam, 8 to 15 percent slopes	2, 637	. 6	Gloucester fine sandy loam, neutral substratum, 3 to 8 percent slopes	881	. 2
Camroden silt loam, 15 to 25 percent slopes	24	(1)	Gloucester fine sandy loam, neutral substratum, 8 to 15 percent slopes	181	(1)
Chagrin silt loam, 0 to 2 percent slopes	152	(1)	Granby fine sandy loam, 0 to 2 percent slopes	613	. 1
Colonie fine sandy loam, 0 to 3 percent slopes	104	(1)	Groveton fine sandy loam, 0 to 3 percent slopes	375	. 1
Colonie fine sandy loam, 3 to 8 percent slopes	344	. 1	Hartland very fine sandy loam, 2 to 6 percent slopes	633	. 1
Colonie fine sandy loam, 8 to 15 percent slopes	184	(1)	Hartland very fine sandy loam, 6 to 12 percent slopes	639	. 1
Colonie fine sandy loam, 15 to 35 percent slopes	126	(1)	Hartland very fine sandy loam, 12 to 20 percent slopes	359	. 1
Colosse gravelly fine sandy loam, 2 to 8 percent slopes	758	. 2	Herkimer silt loam, neutral, 0 to 3 percent slopes	1, 942	. 4
Colosse cobbly loamy fine sand, 2 to 8 percent slopes	4, 070	1. 0	Herkimer silt loam, neutral, 3 to 8 percent slopes	835	. 2
Colosse cobbly loamy fine sand, 8 to 15 percent slopes	1, 557	. 3	Herkimer silt loam, neutral, 8 to 15 percent slopes	233	. 1
Colosse soils, 15 to 45 percent slopes	3, 589	. 8	Herkimer silt loam, acid, 0 to 3 percent slopes	1, 393	. 3
Colton loamy fine sand, 0 to 3 percent slopes	4, 752	1. 0	Herkimer silt loam, acid, 3 to 8 percent slopes	1, 991	. 4
Colton loamy fine sand, 3 to 8 percent slopes	3, 653	. 8	Herkimer silt loam, acid, 8 to 15 percent slopes	514	. 1
Colton loamy fine sand, 8 to 15 percent slopes	1, 376	. 3	Herkimer silt loam, 15 to 25 percent slopes	478	. 1
Colton gravelly loamy sand, 0 to 8 percent slopes	3, 469	. 7	Hinckley sandy loam, neutral substratum, 0 to 3 percent slopes	140	(1)
Colton gravelly loamy sand, 8 to 15 percent slopes	1, 557	. 3	Hinckley sandy loam, neutral substratum, 3 to 8 percent slopes	1, 011	. 2
Colton loamy sand and cobbly loamy sand, 15 to 25 percent slopes	1, 708	. 4	Hinckley sandy loam, neutral substratum, 8 to 15 percent slopes	837	. 2
Colton loamy sand and cobbly loamy sand, 25 to 45 percent slopes	3, 080	. 7	Houseville silt loam, neutral, 0 to 3 percent slopes	1, 711	. 4
Colton soils, 0 to 15 percent slopes, severely blown	119	(1)	Houseville silt loam, neutral, 3 to 8 percent slopes	745	. 2
Colton and Adams soils, 15 to 35 percent slopes, severely blown	179	(1)	Houseville silt loam, acid, 0 to 3 percent slopes	166	(1)
Croghan loamy fine sand, 0 to 5 percent slopes	6, 703	1. 4	Houseville silt loam, acid, 3 to 10 percent slopes	205	(1)
Dover stony loam, 3 to 8 percent slopes	217	(1)	Howard loam, 0 to 3 percent slopes	91	(1)
Dover stony loam, 8 to 15 percent slopes	154	(1)			
Dover very stony loam, 3 to 15 percent slopes	794	. 2			
Dover very stony loam, 15 to 35 percent slopes	1, 861	. 4			
Duane sandy loam, 0 to 5 percent slopes	3, 081	. 7			
Eel silt loam, 0 to 2 percent slopes	717	. 2			
Elmwood sandy loam, 0 to 6 percent slopes	923	. 2			
Empeyville stony loam, 3 to 8 percent slopes	24, 262	5. 2			
Empeyville stony loam, 8 to 15 percent slopes	2, 045	. 4			
Empeyville very stony loam, 3 to 15 percent slopes	9	(1)			

See footnote at end of table.

TABLE 47.—*Approximate acreage and proportionate extent of the soils mapped in detail*—Continued

Soil	Area	Extent
	Acres	*Percent*
Howard loam, 3 to 8 percent slopes	210	(1)
Howard loam, 8 to 15 percent slopes	93	(1)
Howard and Kars soils, 15 to 35 percent slopes	678	0. 1
Hudson silt loam, 0 to 6 percent slopes	575	. 1
Ilion silt loam, 0 to 3 percent slopes	2, 840	. 6
Ilion silt loam, 3 to 8 percent slopes	1, 333	. 3
Junius fine sandy loam, 0 to 3 percent slopes	404	. 1
Kars gravelly loam, 0 to 3 percent slopes	506	. 1
Kars gravelly loam, 3 to 8 percent slopes	457	. 1
Kars gravelly loam, 8 to 15 percent slopes	250	. 1
Kendaia silt loam, 0 to 3 percent slopes	2, 578	. 6
Kendaia silt loam, 3 to 8 percent slopes	591	. 1
Kendaia silt loam, shallow, 0 to 3 percent slopes	1, 263	. 3
Kendaia silt loam, shallow, 3 to 8 percent slopes	51	(1)
Kendaia very stony silt loam, 0 to 15 percent slopes	368	. 1
Lobdell silt loam, 0 to 2 percent slopes	310	. 1
Lobdell shaly silt loam, 0 to 3 percent slopes	585	. 1
Lyons silt loam, 0 to 3 percent slopes	798	. 2
Lyons silt loam, shallow, 0 to 3 percent slopes	482	. 1
Lyons very stony silt loam, 0 to 3 percent slopes	76	(1)
Madalin silt loam, 0 to 2 percent slopes	736	. 2
Made land	55	(1)
Manheim silt loam, 0 to 3 percent slopes	138	(1)
Manheim silt loam, 3 to 8 percent slopes	843	. 2
Manlius silt loam, 0 to 8 percent slopes	329	. 1
Manlius silt loam, 8 to 15 percent slopes	533	. 1
Manlius silt loam, 15 to 35 percent slopes	924	. 2
Marcy silt loam, 0 to 3 percent slopes	7, 659	1. 7
Marcy silt loam, 3 to 8 percent slopes	4, 694	1. 0
Melrose sandy loam, 0 to 6 percent slopes	366	. 1
Melrose sandy loam, 6 to 12 percent slopes	211	(1)
Mohawk silt loam, 2 to 8 percent slopes	396	. 1
Mohawk silt loam, 8 to 15 percent slopes	1, 139	. 2
Mohawk silt loam, 15 to 25 percent slopes	253	. 1
Nellis loam, deep, 2 to 8 percent slopes	10, 051	2. 2
Nellis loam, deep, 8 to 15 percent slopes	3, 497	. 8
Nellis loam, moderately deep, 2 to 8 percent slopes	5, 065	1. 1
Nellis loam, moderately deep, 8 to 15 percent slopes	849	. 2
Nellis loam, moderately deep and deep, 15 to 25 percent slopes	891	. 2
Nellis loam, shallow, 0 to 8 percent slopes	6, 177	1. 3
Nellis loam, shallow, 8 to 15 percent slopes	793	. 2
Nellis loam, shallow, 15 to 25 percent slopes	182	(1)
Nellis loam, 25 to 35 percent slopes	318	. 1
Nellis very stony loam, 3 to 15 percent slopes	163	(1)
Nellis very stony loam, 15 to 35 percent slopes	53	(1)
Nellis loam, ledgy, 3 to 15 percent slopes	675	. 1
Nellis loam, ledgy, 15 to 35 percent slopes	2, 464	. 5
Ondawa loam, 0 to 2 percent slopes	2, 011	. 4
Ondawa loamy sand, 2 to 5 percent slopes	99	(1)
Peat and muck, deep	15, 062	3. 3
Peat and muck, shallow	5, 331	1. 2
Petoskey fine sandy loam, 0 to 3 percent slopes	307	. 1
Petoskey fine sandy loam, 3 to 8 percent slopes	678	. 1
Petoskey fine sandy loam, 8 to 15 percent slopes	775	. 2
Petoskey fine sandy loam, 15 to 25 percent slopes	294	. 1
Petoskey and Hartland fine sandy loams, 25 to 35 percent slopes	217	(1)
Pinckney silt loam, 3 to 8 percent slopes	10, 760	2. 3
Pinckney silt loam, 8 to 15 percent slopes	8, 462	1. 8
Pinckney silt loam, 15 to 25 percent slopes	1, 606	0. 3
Pinckney silt loam, 25 to 35 percent slopes	492	. 1
Pinckney silt loam, 15 to 35 percent slopes, eroded	1, 453	. 3
Podunk loam and fine sandy loam, 0 to 2 percent slopes	1, 349	. 3
Poland silt loam, 3 to 8 percent slopes	2, 814	. 6
Poland silt loam, 8 to 15 percent slopes	2, 387	. 5
Poland silt loam, 15 to 25 percent slopes	706	. 2
Poland and Mohawk silt loams, 25 to 35 percent slopes	71	(1)
Rhinebeck silt loam, 1 to 6 percent slopes	1, 503	. 3
Rhinebeck silt loam, 6 to 12 percent slopes	302	. 1
Ridgebury stony loam, 0 to 5 percent slopes	727	. 2
Ridgebury soils, extremely stony, 0 to 8 percent slopes	4, 017	1. 0
Riverwash	223	(1)
Rockland, gneiss	28, 105	6. 1
Rockland, limestone	477	. 1
Rough broken land	3, 084	. 7
Rumney silt loam, 0 to 2 percent slopes	3, 653	. 8
Saco silt loam, 0 to 2 percent slopes	4, 799	1. 0
Saugatuck loamy fine sand, 0 to 3 percent slopes	4, 602	1. 0
Scantic silty clay loam, 0 to 3 percent slopes	7, 157	1. 5
Scantic silt loam, 0 to 6 percent slopes	1, 500	. 3
Scarboro fine sandy loam, 0 to 2 percent slopes	4, 229	1. 0
Scarboro loamy sand, neutral phase, 0 to 2 percent slopes	740	. 2
Scituate stony fine sandy loam, 3 to 8 percent slopes	3, 290	. 7
Scituate very stony fine sandy loam, 3 to 15 percent slopes	3, 986	. 9
Sloan silt loam, 0 to 2 percent slopes	1, 679	. 4
Suffield silt loam, 0 to 2 percent slopes	60	(1)
Suffield silt loam, 2 to 6 percent slopes	552	. 1
Suffield and Hudson silt loams, 6 to 12 percent slopes	385	. 1
Swanton fine sandy loam, 0 to 2 percent slopes	2, 104	. 5
Tughill stony and very stony silt loams, 0 to 5 percent slopes	8, 266	1. 8
Turin silt loam, 0 to 3 percent slopes	451	. 1
Turin silt loam, 3 to 8 percent slopes	7, 976	1. 7
Turin silt loam, 8 to 15 percent slopes	1, 310	. 3
Wallkill silt loam, 0 to 2 percent slopes	608	. 1
Walpole loam, 0 to 4 percent slopes	2, 035	. 4
Wayland silt loam, 0 to 2 percent slopes	1, 280	. 3
Westbury stony loam, 0 to 3 percent slopes	1, 360	. 3
Westbury stony loam, 3 to 8 percent slopes	12, 241	2. 6
Westbury very stony loam, 0 to 8 percent slopes	51	(1)
Westland silt loam, 0 to 2 percent slopes	1, 261	. 3
Whately fine sandy loam, 0 to 2 percent slopes	2, 467	. 5
Whitman soils, extremely stony, 0 to 8 percent slopes	1, 253	. 3
Worth stony loam, 3 to 8 percent slopes	6, 639	1. 4
Worth stony loam, 8 to 15 percent slopes	19, 778	4. 3
Worth stony loam, 15 to 25 percent slopes	4, 401	1. 0
Worth flaggy silt loam, 3 to 8 percent slopes	540	. 1
Worth flaggy silt loam, 8 to 15 percent slopes	881	. 2
Worth very stony loam, 3 to 15 percent slopes	12	(1)
Worth very stony loam, 15 to 35 percent slopes	227	(1)
Total area covered by detailed survey	463, 368	100. 0

1 Less than 0.1 percent.

TABLE 48.—*Great soil groups and soil catenas*

[Great soil groups and intergrades are designated by symbols: (A)—Alluvial soils; (BF–GBP)—Brown Forest-Gray Brown Podzolic intergrades; (GBP–BF)—Gray Brown Podzolic-Brown Forest intergrades; (GBP–WP)—Gray Brown Podzolic-Weak Podzol intergrades; (HG)—Humic Gley; (LHG)—Low-Humic Gley; (WP)—Weak Podzols; (WP–ABF)—Weak Podzol-Acid Brown Forest intergrades; (WP–L)—Weak Podzol-Lithosol intergrades; and (SP)—Strong Podzols. The Humic Gley and Low-Humic Gley soils are the hydromorphic associates of the other members of the catena]

INTRAZONAL

Parent material	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
Glacial till mainly from—					
Ordovician limestone; some black shale, gneiss, and granite.	Nellis (BF–GBP).	Amenia [1] (BF–GBP).	----------------	Kendaia [1] (LHG).	Lyons (HG).
Crystalline limestone, some gneiss and granite.	Dover (BF–GBP).	Amenia [1] (BF–GBP).	----------------	Kendaia [1] (LHG).	Lyons (HG).
Water-sorted materials of glacial outwash and glacial lake deltas mainly from—					
Crystalline limestone; some gneiss and granite.	Bonaparte (BF–GBP).	----------------	----------------	----------------	
Medium and fine sands from limestone, shale, and gneiss.	Petoskey (BF–GBP).	Galen (BF–GBP).	Junius [2] (BF–GBP).	----------------	Granby [2] (HG).

ZONAL

Parent material	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
Glacial till mainly from—					
Black shale mainly, with some limestone.	Mohawk (GBP–BF).	Manheim [1] (GBP–BF).	----------------	Ilion [1] (LHG)---	Fonda (HG).
Gray shale; some black shale, sandstone, and gneiss and some limestone.	Poland (GBP–BF).	Turin [1] (GBP–BF).	----------------	Ilion [1] (LHG)---	Fonda (HG).
Water-sorted materials of glacial outwash, deltas, and alluvial fans mainly from—					
Ordovician limestone; some gneiss-----	Kars (GBP–BF).	----------------	----------------	----------------	
Black and gray shale----------------	Herkimer (GBP–BF).	----------------	Houseville [3] (GBP–BF).	Glenfield (LHG)-	Westland (HG).
Black and gray shale; some sandstone and limestone.	Howard (GBP–WP).	----------------	----------------	----------------	Westland (HG).
Glacial lake sediments, mainly silt and clay with very fine sand, from—					
Shale, limestone, and gneiss----------	Hudson (GBP)--	----------------	Rhinebeck [3] (GBP)	Madalin [4] (LHG.)	
Glacial till mainly from gneiss; some granite and syenite—					
No fragipan----------------------	Gloucester (WP).	Scituate [1] (WP)-	----------------	Ridgebury [1] (LHG).	Whitman (HG).
Strong fragipan--------------------	Essex (WP)-----	Scituate [1] (WP)-	----------------	Ridgebury [1] (LHG).	Whitman (HG).
Glacial till mainly from gray shale and sandstone—					
Strong fragipan--------------------	Pinckney (WP)-	Camroden [1] (WP).	----------------	Marcy (LHG)---	Alden (HG).
Wet, acid soils---------------------	----------------	----------------	----------------	Gage (LHG)----	
Glacial till mainly from gray shale—					
Shallow to bedrock-----------------	Manlius (WP–L).	----------------	----------------	----------------	
Water-sorted materials of glacial outwash mainly from—					
Gneiss and granite; some crystalline limestone.	Hinckley (WP)--	----------------	----------------	----------------	
Glacial lake sediments and deltaic sands mainly—					
Fine sands from shale and sandstone--	Colonie (WP–ABF).	----------------	----------------	----------------	
Medium sands from gneiss and granite overlying silt and clay.	Melrose (WP)---	Elmwood [1] (WP).	----------------	Swanton [1] (LHG).	Whately (HG).
Fine and very fine sands from gneiss and granite overlying silt.	Hartland (WP)--	Buxton (WP)---	----------------	----------------	
Gray silt and clay, chiefly from gneiss and granite.	Suffield (WP)---	Buxton [1] (WP)--	----------------	Scantic [1] (LHG)-	Biddeford (HG).

See footnotes at end of table.

TABLE 48.—*Great soil groups and soil catenas*—Continued

[Great soil groups and intergrades are designated by symbols: (A)—Alluvial soils; (BF-GBP)—Brown Forest-Gray Brown Podzolic intergrades; (GBP-BF)—Gray Brown Podzolic-Brown Forest intergrades; (GBP-WP)—Gray Brown Podzolic-Weak Podzol intergrades; (HG)—Humic Gley; (LHG)—Low-Humic Gley; (WP)—Weak Podzols; (WP-ABF)—Weak Podzol-Acid Brown Forest intergrades; (WP-L)—Weak Podzol-Lithosol intergrades; and (SP)—Strong Podzols. The Humic Gley and Low-Humic Gley soils are the hydromorphic associates of the other members of the catena]

ZONAL—Continued

Parent material	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
Glacial till mainly from gneiss and granite—					
No fragipan	Hermon (SP)	Waumbek [1] (SP)		Ridgebury [1] (LHG).	Whitman (HG).
Strong fragipan	Becket (SP)				
Glacial till mainly from sandstone—					
Strong fragipan	Worth (SP)	Empeyville [1] (SP).		Westbury [1] (LHG).	Tughill (HG).
Water-sorted materials of glacial outwash and glacial lake deltas mainly from—					
Gneiss and granite	Colton (SP)	Duane (SP)		Walpole (LHG)	Scarboro (HG).
Sandstone; some gray shale	Colosse (SP)				
Gravel-free sands of glacial lake deltas mainly—					
Fine sands from gneiss and granite	Adams (SP)	Croghan [1] (SP)		Saugatuck [1] (LHG).	Scarboro (HG).
Old alluvial material	Groveton (SP)				

AZONAL

Parent material	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
Sediments from Podzol upland soils	Ondawa (A)	Podunk [1] (A)		Rumney [1] (LHG).	Saco (HG).
Sediments from Gray Brown Podzolic upland soils—					
Acid surface soil, alkaline to slightly acid subsoil.	Chagrin (A)	Lobdell [1] (A)		Wayland [1] (LHG).	Sloan (HG).
Sediments from Brown Forest upland soils—					
Neutral surface soil and alkaline subsoil.	Genesee (A)	Eel [1] (A)		Wayland [1] (LHG).	Sloan (HG).
Organic materials—					
Silt over peat					Wallkill (HG).
Peat and muck					Peat and muck (HG).

[1] Includes some areas of somewhat poorly drained soils.
[2] Includes some areas of poorly drained soils.
[3] Includes some areas of moderately well drained soils.
[4] Includes some areas of very poorly drained soils.

Adams Series

The soils of the Adams series are well drained to excessively drained. They have developed on glaciofluvial fine sands derived mainly from gneiss, granite, and syenite. The soils occur on deltas, outwash plains, and beach ridges.

These soils belong to the same catena[4] as the moderately well drained to somewhat poorly drained Croghan soils, the poorly drained to somewhat poorly drained Saugatuck soils, and the very poorly drained Scarboro soils. They are associated with soils of the Colton and Suffield series. Except that they are free from gravel, they are similar to the Colton soils. Unlike the Suffield soils, which are silt loams, they have a texture of fine sand or very fine sand. The Adams soils are Podzols.

[4] A catena is a group of soils, within a specific soil zone, formed from similar parent materials but with unlike soil characteristics because of differences in relief or drainage.

Typical profile (Adams loamy fine sand—undisturbed):

A_0 3 to 0 inches, forest litter over black, well-decomposed organic matter matted with fine roots; fine crumb structure; has greasy feel; pH 4.0 to 4.5; 2 to 5 inches thick; abrupt lower boundary.

A_2 0 to 3 inches, gray (10YR 5/1) loamy fine sand; single grain (structureless); very friable; strongly leached; pH 4.0 to 4.2; 1 to 4 inches thick; abrupt lower boundary.

B_{2h} 3 to 7 inches, black (N 2/0) precipitated organic matter; very weak, very fine granular structure; weakly to strongly cemented in places, but cementation not continuous; pH 4.0 to 4.2; clear lower boundary.

B_{2ir} 7 to 11 inches, dark reddish-brown (2.5YR 3/4) loamy fine sand; weak fine crumb structure; weakly to strongly cemented in places and breaks to large irregular hard clods; pH 4.4 to 4.6; 3 to 6 inches thick; gradual lower boundary.

B_3 11 to 23 inches, yellowish-brown (10YR 5/4) fine to very fine, very friable sand; single grain; rapidly permeable to water; low water-holding capacity; pH 5.0 to 5.3; 10 to 15 inches thick; diffuse lower boundary.

C 23 inches+, light yellowish-brown (10YR 6/4) fine to very fine sand; single grain; loose, open, and porous; very low water-holding capacity; pH 5.0 to 5.5.

Range in characteristics: Fine gravel occurs in some places in the surface soil. In the valley of the Black River, silt and clay occur in places at depths between 4 and 20 feet. In the sand plains east of the river, also at depths between 4 and 20 feet, there are stratified beds of gravel and sand. In some places medium-textured sand occurs in the profile instead of fine sand or very fine sand. The soil in the upper horizons in some areas has been mixed by plowing and is brown to grayish brown, depending on the amount of organic matter.

Relief: Level to steep. In areas where the original forest cover has been removed, blowouts are common.

Drainage: Surface runoff is slow and internal drainage is rapid. The water-holding capacity is low. In many places the growth of plants is limited by lack of available moisture.

Native vegetation: Hemlock, white pine, and northern hardwoods, chiefly hard maple and beech.

MAPPING UNITS

The following mapping units are in the Adams series:

Adams loamy fine sand, 0 to 3 percent slopes (AaA; Group 23[5]).
Adams loamy fine sand, 3 to 8 percent slopes (AaB; Group 23).
Adams loamy fine sand, 8 to 15 percent slopes (AaC; Group 24).
Adams loamy fine sand, 15 to 35 percent slopes (AaD; Group 42).

Adams loamy fine sand, 0 to 15 percent slopes, severely blown (AaS; Group 42).—This soil has lost the uppermost 12 to 18 inches through wind erosion. To prevent the areas from becoming blown out, the soil needs to be stabilized by using a plant cover.

Adams and Colton soils, morainic, 3 to 8 percent slopes (AbB; Group 23).—This mapping unit is made up of areas of Adams and Colton soils so intermixed that it was not feasible to map them separately. In most places the soil consists of deep deposits of fine sands similar to the typical Adams soil but having many large boulders on the surface. In cultivated areas most of the boulders have been removed, but partly buried boulders and the rocks along fence rows identify the areas.

Adams and Colton soils, morainic, 8 to 15 percent slopes (AbC; Group 24).—This mapping unit is made up of irregularly rolling areas of nongravelly Adams soils and gravelly Colton soils that are intermixed.

Alden Series

The soils of the Alden series are very poorly drained. They have developed on glacial till derived mainly from Ordovician shales that included small amounts of sandstone. The shales and sandstone are of the Lorraine group. These soils occur along the northern and eastern edges and slopes of the Tug Hill Plateau.

These soils belong to the same catena as the well-drained Pinckney soils, the moderately well drained to somewhat poorly drained Camroden soils, and the poorly drained Marcy soils. The Pinckney and Camroden soils are acid, but the Marcy soils are neutral. Although the shale and sandstone from which the Alden soils have formed are generally acid in reaction, the ground water is strongly alkaline. As a result some areas of these soils are neutral to slightly acid. The Alden soils belong to the Humic Gley great soil group.

Typical profile (Alden silt loam—undisturbed):

A_1 0 to 6 inches, very dark gray (10YR 3/1) to very dark grayish-brown (10YR 3/2) silt loam; strong medium to fine crumb structure; friable when moist and nonsticky when wet; high in organic matter and matted with roots; pH 5.0 to 5.3; 5 to 10 inches thick; clear lower boundary.

B_{21g} 6 to 11 inches, gray to dark-gray (N 5/0 to 4/0 or 2.5Y 5/1) heavy silt loam; many, fine to medium, faint mottles of strong brown (7.5YR 5/6); moderate medium subangular blocky structure but medium crumb when crushed; friable to slightly firm when moist, sticky and plastic when wet; pH 5.5 to 5.8; 4 to 7 inches thick; clear to gradual lower boundary.

B_{22g} 11 to 22 inches, gray to dark-gray (2.5Y 5/1 to 4/0) silty clay loam; many, fine to medium, olive-gray (5Y 4/2) and dark yellowish-brown (10YR 4/4) mottles; strong coarse blocky structure; firm when moist, sticky and plastic when wet; contains some shale fragments and crystalline rocks; dense in place; pH 6.2 to 6.4; 10 to 24 inches thick; diffuse lower boundary.

C_1 22 inches +, very dark grayish-brown (10YR 3/2) silt loam to silty clay loam faintly mottled with olive gray (5Y 4/2); weak medium blocky structure; firm in place but friable when removed, and slightly sticky and plastic when wet; contains shale and some erratics of crystalline rock; pH 6.5 to 7.0; saturated with water for long periods.

Range in characteristics: The color of the soil ranges from dark brown to dark gray or black depending on the amount of organic matter in the profile. In areas that are under forest and that are saturated for shorter periods of time than normal, the soil is brown. In places that are under a cover of grass and sedges, the soil is darker colored. The texture of the surface soil ranges from silt loam to silty clay loam. In some areas along drainageways, the silt loams occur in association with soils covered by a thin layer of local alluvium.

Relief: Flat to depressed. In some places on steep slopes, the soil occurs in seepy spots.

Drainage: Very poor. Because of the density and heavy texture of the parent material, surface runoff is slow to ponded and internal drainage is very slow.

Native vegetation: Hemlock, red maple, elm, and willow. In areas near the soils that are transitional to soils of the Worth catena, balsam and red spruce predominate.

MAPPING UNIT

The following is the only soil type and the only mapping unit of the Alden series in Lewis County.

Alden silt loam, 0 to 3 percent slopes (AcA; Group 33).

Alluvial Land

Alluvial land is made up of materials that have washed from the adjacent uplands. It occurs along the minor streams in all parts of the county on small terraces and nearly flat, narrow bottoms, or stream valleys. The meandering stream channels have cut the areas into small segments. Drainage ranges from good to very poor but is predominantly poor to very poor.

The parent materials of Alluvial land vary. Near the Tug Hill Plateau, the soil materials are strongly acid and have washed from soils formed predominantly from sandstone and shale. In the central part of the county, they are generally alkaline and have washed from soils formed mainly from limestone. East of the Black River, they are acid and have washed from soils formed from crystalline rock. Fresh deposits are continually being added to Alluvial land, so there is little profile development.

Most of Alluvial land is made up of recent alluvium. In some areas, however, materials from remnants of small terraces are included. These areas resemble the areas of adjacent soils that have formed on outwash materials.

MAPPING UNIT

Alluvial land (AdA; Group 36).

[5] Number indicates management group to which mapping unit belongs.

Amenia Series

The soils of the Amenia series are moderately well drained to somewhat poorly drained. They have formed from firm, highly calcareous till of Late Wisconsin age. The till was derived mainly from Ordovician limestone and dark shales that included varying amounts of crystalline metamorphic rocks.

These soils belong to the same catenas as the well-drained Nellis and Dover soils, the poorly drained to somewhat poorly drained Kendaia soils, and the very poorly drained Lyons soils. They belong to the Brown Forest great soil group.

Typical profile (Amenia loam—undisturbed):

A_1 0 to 6 inches, very dark brown (10YR 2/2) silt loam to loam; strong fine to medium crumb structure; very friable when moist, and slightly sticky and plastic when wet; much earthworm activity, and, therefore, forest litter of the fall season is usually well decomposed by summer; pH 6.2 to 6.5; 4 to 7 inches thick; clear lower boundary.

B_{21} 6 to 11 inches, brown (7.5YR 5/4) to dark-brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure but fine crumb when crushed; friable to very friable when moist, and slightly sticky and plastic when wet; this horizon shows considerable mixing by worms; many roots; good water-holding capacity; pH 6.2 to 6.5; 4 to 10 inches thick; gradual lower boundary.

B_{22g} 11 to 24 inches, brown (10YR 5/3) silt loam; common, fine to medium, distinct mottles of brown and strong brown; weak medium subangular blocky structure but fine to medium crumb structure when crushed; friable when moist, and slightly sticky and plastic when wet; readily penetrated by roots; good water-holding capacity; pH 6.5 to 7.0; 9 to 18 inches thick; clear lower boundary.

C_1 24 inches +, dark grayish-brown (10YR 4/2) high-lime glacial till with gritty silt loam texture; moderate medium to thick platy structure; slightly firm to firm when moist, and nonsticky and slightly plastic when wet; readily penetrated by roots; good water-holding capacity; calcareous.

Range in characteristics: The colors of the soil when dry are lighter than those indicated in the profile description, which are for moist soil. Reaction ranges from neutral where the soil is associated with typical Nellis and Dover soils to moderately acid where it is associated with the acid Nellis soils. Depth to bedrock ranges from 12 to more than 40 inches. Many areas are nearly stone free. These have wind- or lake-laid deposits of very fine sand and coarse silt, as much as 18 inches deep, on the surface. In places, these deposits have influenced the texture of the soil to a depth of 12 inches. In areas of Amenia loam, shallow, the C horizon is absent. Here, the soil immediately above bedrock is colored dark brown by an accumulation of decaying roots.

Relief: Nearly level to strongly sloping. On slightly convex or straight slopes, the dominant range is 2 to 8 percent.

Drainage: Moderately good, but ranges to somewhat poor in places. Runoff is medium, and internal drainage is slow to medium.

Native vegetation: Hard maple, beech, basswood, white ash, black cherry, and some hophornbeam, soft maple, and elm.

MAPPING UNITS

The following mapping units are in the Amenia series:

Amenia loam, deep, 0 to 3 percent slopes (AgA; Group 13).

Amenia loam, deep, 3 to 8 percent slopes (AgB; Group 7).

Amenia loam, moderately deep, 0 to 3 percent slopes (AfA; Group 13).—Except that limestone bedrock occurs at depths of 24 to 40 inches, this soil is similar to the typical soil described for the series. Because of the shallower depth to bedrock, yields on this soil are less in abnormally dry seasons than on the deeper soils.

Amenia loam, moderately deep, 3 to 8 percent slopes (AfB; Group 7).

Amenia loam, shallow, 2 to 8 percent slopes (AeB; Group 34).—This soil consists of a mixture of mineral soil and organic matter. The depth to limestone bedrock ranges from 10 to 24 inches. Where depth to the bedrock is between 10 and 12 inches, the soil shows little profile development. This soil is a dark grayish color but is somewhat lighter colored just above bedrock. It is moderately well drained. The soil is droughty, even in seasons of normal rainfall, and crops and pasture produce low yields.

Becket Series

The soils of the Becket series have strongly developed fragipans. They have formed on glacial till of Late Wisconsin Age. The till was derived mainly from gneiss, granite, and syenite.

The soils of the Becket series were not mapped in detail. In the reconnaissance mapping of the forested eastern part of the county, the Becket soils were included in several soil associations. These associations are described in the section, Soil Associations. The well drained Becket soils occur in the same associations as the well drained Hermon soils, the moderately well drained to somewhat poorly drained Waumbek soils, the poorly drained to somewhat poorly drained Ridgebury soils, and the very poorly drained Whitman soils. All of these soils have formed from similar parent material, but only the Becket soils have fragipans. The Becket soils are Podzols.

Typical profile (Becket fine sandy loam—undisturbed):

A_0 Very dark gray to black root mor horizon; pH 3.8 to 4.0; 2 to 4 inches thick; abrupt lower boundary.

A_2 0 to 3 inches, pinkish-gray (7.5YR 6/2) stony fine sandy loam; single grain; friable; pH 4.0 to 4.5; 2 to 5 inches thick; abrupt lower boundary.

B_{21h} 3 to 5 inches, dark reddish-brown (5YR 3/2 to 2/2) fine sandy loam to sandy loam; weak fine crumb structure; slightly cemented in places; friable; high in organic matter; pH 4.0 to 4.5; 1 to 4 inches thick; clear lower boundary.

B_{22} 5 to 12 inches, strong-brown (7.5YR 5/8) stony sandy loam; very weak subangular blocky structure but weak fine crumb when crushed; friable; pH 4.5 to 4.7; 5 to 10 inches thick; gradual lower boundary.

B_3 12 to 22 inches, brown (10YR 5/3) stony loamy fine sand; weak fine crumb structure to single grain; slightly firm in place and friable when removed; pH 4.5 to 5.0; 8 to 12 inches thick; gradual lower boundary.

B'_{21} 22 to 34 inches, brown (10YR 5/3) stony sandy loam; weak thick platy structure; peds firm and brittle when removed; pH 5.4 to 5.6; 8 to 14 inches thick; gradual lower boundary.

B'_{22} 34 to 50 inches, light olive-brown (2.5Y 5/4) stony sandy loam to loamy sand; strong medium platy structure; compact, dense, and hard in place; peds very firm and somewhat brittle when removed; pH 4.5 to 5.0; 12 to 20 inches thick; gradual lower boundary.

C 50 inches+, grayish-brown (10YR 5/2) stony glacial till with coarse sandy loam texture; firm and massive in place, but single grain when removed; pH 5.0 to 5.4.

Range in characteristics: The solum above the fragipan (B′ horizons) ranges from 18 to 36 inches in thickness. The texture of the surface soil ranges from loam to coarse sandy loam, and the soil is stony to extremely stony. The development of the upper horizons varies within short distances from strong to weak.

Relief: Gently sloping to steep.

Drainage: Runoff is medium to rapid, and internal drainage is medium to slow.

Native vegetation: Northern hardwoods, mainly beech and hard maple, and some yellow birch, white pine, and hemlock.

Biddeford Series

The soils of the Biddeford series are very poorly drained. They have developed on deposits of silt and clay laid down in glacial lakes and occur in the lowest parts of these basins of old lakes.

These soils are in the same catena as the well drained Suffield soils, the moderately well drained to somewhat poorly drained Buxton soils, and the poorly drained to somewhat poorly drained Scantic soils. They are finer textured than the Scantic and Buxton soils with which they are associated. The Biddeford soils belong to the Humic Gley great soil group.

Typical profile (Biddeford silty clay loam—undisturbed):

A_1 0 to 6 inches, very dark gray (10YR 3/1) silty clay loam; moderate coarse crumb structure; firm in place and matted with roots; sticky and very plastic when wet; pH 5.0 to 5.5; 4 to 8 inches thick; clear lower boundary.

BG 6 to 16 inches, olive-gray (5Y 4/2) silty clay; common faint mottles of light gray; dense and tight in place; weak coarse angular blocky structure; very hard when dry, and sticky and plastic when wet; pH 5.4 to 5.8; 8 to 14 inches thick; clear lower boundary.

C 16 inches+, light olive-gray (5Y 6/2) clay; common coarse mottles of yellowish brown and gray; very dense and compact in place; strong coarse angular blocky structure that is indistinct when wet but very pronounced when dry; very hard when dry, and plastic when wet; this horizon is saturated continuously; pH 5.8 to 6.2.

Range in characteristics: In some places the surface horizon is a thin layer of peat or muck. In places the color of the surface horizon is gray to dark gray. The texture is dominantly silty clay loam, but in places a silty alluvial material covers the surface.

Relief: Level to depressed.

Drainage: Very poor. There is no surface runoff, and the density of the silty clay subsoil prevents movement of water through the soil.

Native vegetation: Soft maple, willow, elm, and some hemlock on forested areas. Swamp grass, sedges, and cattails on nonforested areas.

MAPPING UNIT

The following is the only soil of the Biddeford series mapped in Lewis County. The profile is the same as the typical profile described for the series.

Biddeford silty clay loam, 0 to 2 percent slopes (BaA; Group 33).

Blownout Land

Blownout land consists of areas that have had much of the soil material removed by wind. These areas occur east of the Black River on sands, outwash material, and glacial till. They are on the break between the high, level sand plain and the valley terraces. The areas range in size from 1 or 2 acres to 100 acres or more. They occur most commonly on west-facing slopes.

Blownout land has developed in areas where the forest cover has been completely removed and in areas that were once farmed and then left unprotected. Once under way, blowouts increase in size at a fairly rapid rate, and the moving sand kills and buries the forests on the leeward side. The original soils in these blownout areas were the Adams and Colton and similar soils.

Blowouts are difficult to control. The areas need to be reforested, but the sterile sands lack plant nutrients, and growth of seedlings is slow. In some places the wind uncovers the roots of seedlings before they have a chance to become established. Seedlings can be protected to some extent, however, by covering newly planted areas with brush and trash.

Scotch pine is the best species to use for reforesting these areas. It tolerates dry conditions and can grow on soils of low fertility. Red pine is not so well suited. Cultivated areas in this section, particularly on the crests of slopes, should not be overgrazed or left unprotected.

MAPPING UNIT

Blownout land (BbD; Group 42).

Bonaparte Series

The soils of the Bonaparte series are well drained. They have formed from glacial outwash derived mainly from crystalline limestone mixed with granitic material. The soils are on terraces or kames. They occur in the northern part of the county in the town of Diana.

This soil is similar to the Dover soils that have formed on glacial till. The Bonaparte soil has a brown horizon immediately above the strongly calcareous outwash. This horizon consists mainly of organic material and some clay. It resembles the lower part of the B horizon of the Kars soils. The soils of the Bonaparte series belong to the Brown Forest great soil group.

Typical profile (Bonaparte gravelly sandy loam—cultivated):

A_p 0 to 5 inches, dark-brown (10YR 3/3) loamy sand; moderate medium crumb structure; very friable; pH 7.0; 4 to 7 inches thick; clear lower boundary.

B_{21} 5 to 10 inches, brown (7.5YR 5/4) loamy sand; weak fine crumb structure; very friable; pH 6.4 to 7.0; 4 to 6 inches thick; clear lower boundary.

B_{22} 10 to 20 inches, strong-brown (7.5YR 5/6) loamy sand; very weak fine crumb structure; very friable; pH 6.5 to 7.0; 8 to 12 inches thick; gradual lower boundary.

B_{23} 20 to 24 inches, brown (7.5YR 4/4) sand or loamy sand; very weak crumb structure; very friable to loose; contains concentrations of white calcite crystals in places and is uniformly calcareous in some places; darker colored than horizon immediately above and is darkest next to the concentrations of calcite crystals; pH 7.5; 3 to 6 inches thick; clear to gradual lower boundary.

C 24 inches+, a mixture of calcite, feldspar, quartz, and ferromagnesian minerals of the size of sand or gravel; contains calcite boulders of Grenville limestone; structureless; loose; very rapidly permeable; calcareous.

Range in characteristics: The solum ranges from 18 to 36 inches in thickness. Its reaction is generally higher than pH 6.0 throughout. In places, however, the pH is as low as 5.5 in the B_{22} horizon, especially where the depth to carbonates is greatest. The texture of the surface soil ranges from loamy sand to sandy loam, and the soil is gravelly to nongravelly. Many of the calcite crystals that occur in the C horizon are the size of sand or fine gravel, and some calcite crystals occur in these sizes in the upper horizons.

Relief: Nearly level to hilly.

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Drainage: Well drained to somewhat excessive. Surface runoff is slow. Internal drainage is very rapid.
Native vegetation: The trees on woodlots are mainly hard maple, beech, black cherry, basswood, and ironwood. In abandoned areas, whitecedar is prominent.

MAPPING UNITS

The following mapping units are in the Bonaparte series:

Bonaparte gravelly sandy loam, 2 to 8 percent slopes (BcB; Group 23).
Bonaparte gravelly sandy loam, 8 to 15 percent slopes (BcC; Group 24).
Bonaparte gravelly sandy loam, 15 to 45 percent slopes (BcE; Group 42).

Buxton Series

The soils of the Buxton series are moderately well drained to somewhat poorly drained. They have developed on glaciolacustrine deposits of silt and clay or very fine sands mixed with silt. They occur in widely scattered areas that are mostly in regions of crystalline metamorphic and igneous rocks. The largest areas are north of Croghan on the east side of the Black River.

These soils are in the same catena as the well-drained Suffield soils, the poorly drained to somewhat poorly drained Scantic soils, and the very poorly drained Biddeford soils. The parent material of all of these soils is silt and clay. In areas where the parent material of the Buxton soils is fine sand or very fine sand, these soils are in the same catena as the well-drained Hartland soils. In contrast to the well-drained Suffield and Hartland soils, the Buxton soils are mottled at depths below 15 inches. They are brown in contrast to the poorly drained soils, which are gray to dark gray. The soils of the Buxton series are weak Podzols.

Typical profile (Buxton silt loam—undisturbed):

A_0 2 to 0 inches, forest litter over dark-brown to black decomposed organic matter, mixed somewhat with mineral material from the horizon below; pH 4.5 to 5.0; 1 to 3 inches thick.

A_1 0 to 5 inches, dark grayish-brown (10YR 4/2, moist) silt loam; light brownish gray (10YR 6/2) when dry; moderate medium crumb structure; friable when moist and sticky when wet; high in organic matter; pH 5.0 to 5.5; 3 to 6 inches thick; abrupt lower boundary.

B_{21r} 5 to 13 inches, brown (7.5YR 5/4) silt loam or silty clay loam; weak medium subangular blocky structure, but fine crumb when crushed; friable when moist and sticky and plastic when wet; pH 5.4 to 5.6; 5 to 10 inches thick; clear lower boundary.

B_{22} 13 to 19 inches, dark-brown (10YR 4/3) to dark yellowish-brown (10YR 4/4) silty clay loam; common, fine, faint mottles of pale brown (10YR 6/3); strong fine angular blocky structure; friable when moist, sticky and plastic when wet, and hard when dry; readily penetrated by roots; high water-holding capacity; pH 5.8 to 6.0; 4 to 8 inches thick; gradual lower boundary.

B_{23} 19 to 25 inches, olive-brown (2.5Y 4/4) silty clay loam; common, distinct mottles of brown (10YR 5/3); strong medium blocky structure; peds firm when moist and very hard when dry; outer surfaces of peds have collodial clay coating of light gray; pH 6.2 to 6.4; 5 to 7 inches thick; gradual lower boundary.

B_3 25 to 40 inches, brown (10YR 5/3) silty clay loam, distinctly laminated; weak medium blocky structure; firm when moist, plastic when wet, and very hard when dry; pH 6.5 to 6.8; 10 to 20 inches thick; gradual lower boundary.

C 40 inches+, dark grayish-brown (10YR 4/2) varved silt and clay; massive; dense in place; the extreme density prevents penetration of roots; pH 7.0+.

Range in characteristics: The texture in most areas is silt loam. The areas of very fine sandy loam are of small extent and occur in association with the Hartland soils. Mapped with these soils are some areas in which drainage is somewhat poor. The soil in these areas is more distinctly mottled and the mottles are closer to the surface than in the typical soil.
Relief: Gently rolling. The dominant range is 2 to 6 percent.
Drainage: Surface runoff is medium and internal drainage is slow. Dominantly moderately well drained but ranges to somewhat poor in places.
Native vegetation: Hard maple, beech, soft maple, yellow birch, elm, black cherry, gray birch, and aspen.

MAPPING UNITS

The following mapping units are in the Buxton series:

Buxton silt loam, 0 to 2 percent slopes (BdA; Group 13).
Buxton silt loam, 2 to 6 percent slopes (BdB; Group 9).
Buxton very fine sandy loam, 0 to 6 percent slopes (BeB; Group 9).—Except that the texture of this soil in the horizons above the substratum is very fine sandy loam, this soil is similar to the typical soil described for the series. It has a grayish, silty substratum similar to that in the Buxton silt loams.

Camroden Series

The soils of the Camroden series are moderately well drained to somewhat poorly drained. They are medium textured and have strongly developed fragipans (A′ and B′ horizons). These soils have developed from glacial till of Late Wisconsin age. The till was derived mainly from gray shale that included some fine-grained sandstone. These soils are extensive on the outer edge of the Tug Hill Plateau, especially the northern part.

The soils are in the same catena as the well-drained Pinckney soils, the poorly drained Marcy soils, and the very poorly drained Alden soils. The Pinckney soils and the moderately well drained areas of the Camroden soils are strongly acid. The ground water in areas of the somewhat poorly drained Camroden soils and the very poorly drained Alden soils is alkaline, and these soils, therefore, are less acid. The Camroden soils are weak Podzols.

Typical profile (Camroden silt loam—cultivated):

A_1 0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; moderate medium to fine crumb structure; friable when moist and slightly sticky when wet; pH 4.5 to 5.0; 4 to 6 inches thick; clear lower boundary.

B_2 6 to 16 inches, dark yellowish-brown (10YR 4/4) silt loam; common, medium to fine, yellowish-brown (10YR 5/6) mottles; weak coarse crumb structure; friable to very friable when moist and slightly sticky when wet; pH 4.8 to 5.0; 8 to 12 inches thick; clear lower boundary.

A'_2 16 to 21 inches, light olive-brown (2.5Y 5/3) loam to silt loam; many medium to fine mottles of yellowish brown (10YR 5/6); moderate to weak thin platy structure; friable to slightly firm when moist; pH 4.8 to 5.0; 4 to 6 inches thick; gradual lower boundary.

B'_{21} 21 to 33 inches, very coarse prisms coated with light brownish-gray loam or very fine sandy loam that is one-fourth inch thick at top of prisms and decreases to a thin film below; interiors are olive-gray (5Y 4/2) to dark grayish-brown (2.5Y 4/2) heavy silt loam to silty clay loam; many fine to medium mottles of light olive brown (2.5Y 5/3); very firm to extremely firm when moist and extremely hard when dry; compound coarse prismatic to weak angular blocky structure; roots penetrate mainly along the planes of the prisms; high water-holding capacity; pH 5.0 to 5.5; 10 to 14 inches thick; gradual lower boundary.

B'_{22} 33 to 60 inches, very coarse prisms coated dark olive gray (5Y 3/2); interiors are light olive-brown (2.5Y 5/3) silt loam to light silty clay loam; very weak blocky structure to massive; many, fine, light olive-brown (2.5Y 5/5) mottles; very firm at top of horizon to firm at bottom of horizon; roots penetrate only along planes of the prisms; high water-holding capacity; pH 5.2 to 6.0; less acid with depth; 20 to 30 inches thick; diffuse lower boundary.

C 60 inches +, light olive-brown (2.5Y 5/3) silt loam; weak medium blocky structure commonly arranged in thick platelike layers; peds firm when moist and hard when dry; pH 6.0 to 7.0.

Range in characteristics: In places in the B_2 horizon, the mottling is faint and the depth to strong mottling is 20 inches. In some places the pH is 6.0 at depths of 30 inches. In others the pH is 5.0 at depths of 60 to 72 inches, but the pH is always greater in the fragipan horizons. The silt loams are strongly acid, but the areas of silty clay loam are less acid. In many places stones and boulders of Adirondack gneiss are scattered over the surface of the soil.

Relief: Gently sloping to strongly sloping; uniform to convex slopes.

Drainage: Moderately good to somewhat poor. Surface runoff is medium to rapid. Internal drainage is slow because of the fragipan. Areas generally receive little runoff from adjacent areas.

Native vegetation: Hard maple, beech, hemlock, some white pine, elm, and soft maple.

MAPPING UNITS

The following mapping units are in the Camroden series:

Camroden silt loam, 0 to 3 percent slopes (CaA; Group 13).

Camroden silt loam, 3 to 8 percent slopes (CaB; Group 10).

Camroden silt loam, 8 to 15 percent slopes (CaC; Group 18).—The uneroded areas of this soil are similar to the typical soil, but some areas are severely eroded. The severely eroded areas are on the escarpment between the Tug Hill Plateau and the valley of the Black River. In these areas most of the original surface soil has been lost and in places part of the upper subsoil. The present surface layer is made up of subsoil mixed with some organic matter. Mottles occur at depths between 6 and 8 inches, and shale bedrock is at depths between 20 and 28 inches.

Camroden silt loam, 15 to 25 percent slopes (CaD; Group 28).—The horizons of this soil are thinner than in the typical soil, and in most places bedrock occurs at depths between 30 and 36 inches. In places this soil is severely eroded and practically all of the soil material has been lost. Little of this soil is cultivated, but it is used for permanent pasture.

Chagrin Series

The soils of the Chagrin series are well drained. They have developed on alluvium washed from soils of the uplands that were formed from glacial drift. The drift was made up mainly of shale and sandstone but included small amounts of other rocks. The soils occur on the flood plains along minor streams that issue from the Tug Hill Plateau.

These soils are in the same catena as the moderately well drained to somewhat poorly drained Lobdell soils, the poorly drained to somewhat poorly drained Wayland soils, and the very poorly drained Sloan soils. They are more acid than the Genesee soils, which also were formed from sediments washed from uplands. The parent material of the Genesee soils, however, was derived mainly from limestone and calcareous shale. The Chagrin soils are in the Alluvial great soil group.

Typical profile (Chagrin silt loam—undisturbed):

A_0 1 to 0 inch of forest litter, well decomposed in the lower part.

A_1 0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; strong medium crumb structure; friable when moist; pH 5.0 to 5.8; 6 to 9 inches thick; clear lower boundary.

C_1 8 to 30 inches, grayish-brown (10YR 5/2) to brown (10YR 5/3) silt loam; weak fine to medium crumb structure; friable when moist and nonsticky when wet; has good moisture-holding capacity and is readily penetrated by roots; pH 5.5 to 6.3; 12 to 24 inches thick; diffuse lower boundary.

C_2 30 inches +, dark grayish-brown (10YR 4/2) silt loam, loam, or sandy loam; weak medium to fine crumb structure; friable when moist; in some places layers of shale or fine to coarse gravel alternate with lenses of medium to coarse sandy loam; pH 6.5 to 7.0.

Range in characteristics: The texture of the surface soil ranges from sandy loam to silt loam. In places shale or a small amount of gravel is on the surface, and beds of shaly material or gravel occur in any place in the profile.

Relief: Nearly level.

Drainage: Well drained but subject to periodic flooding.

Native vegetation: Soft maple, elm, willow, alder, basswood, and ash.

MAPPING UNIT

The following is the only member of the Chagrin series mapped in the county. It is similar to the typical soil described for the series.

Chagrin silt loam, 0 to 2 percent slopes (CbA; Group 11).

Colonie Series

The soils of the Colonie series have developed on fine- to medium-textured deltaic sands derived mainly from acid sandstone and shale. The deltaic sands came from the slopes of the Tug Hill Plateau. They are of the same age as the sands on the plain east of the Black River that were formed from material washed from the foothills of the Adirondacks.

These well-drained soils are the only soils of their catena mapped in Lewis County. Associated with them are the moderately well drained and poorly drained soils of the acid phases of the Houseville and Glenfield series. The Colonie soils are weak Podzols.

Typical profile (Colonie fine sandy loam—cultivated):

A_p 0 to 8 inches, dark-brown (10YR 4/3) fine sandy loam; moderate fine to medium crumb structure; very friable when moist and nonsticky when wet; pH 5.0 to 5.5; 6 to 9 inches thick; abrupt lower boundary.

A_{21} 8 to 12 inches, brownish-yellow (10YR 6/6) to yellowish-brown (10YR 5/6) fine sandy loam; weak medium to fine crumb structure; fluffy in places; pH 5.0 to 5.6; 3 to 5 inches thick; clear lower boundary.

A_{22} 12 to 26 inches, yellowish-brown (10YR 5/6 to 5/8) fine sandy loam; weak fine crumb structure; slightly firm in place but easily crushed when removed; moderate to low moisture-holding capacity; pH 5.0 to 5.5; 12 to 16 inches thick; gradual lower boundary.

B_{21} 26 to 38 inches, alternating bands, 2 to 8 inches wide, of dark grayish-brown (10YR 4/2) loamy fine sand to fine sandy loam that is high in shale; single grain; loose to friable. These bands are separated by bands ½ to 2 inches wide of dark-brown (10YR 4/3) to dark yellowish-brown (10YR 4/4) clayey fine sandy loam that is nearly structureless; slightly firm to friable and easily penetrated by roots; moderate moisture-holding capacity; pH 5.0 to 5.5; 10 to 16 inches thick; gradual lower boundary.

B_{22} 38 to 44 inches, very dark grayish-brown (10YR 3/2) shaly medium sand; single grain; slightly firm in place

and friable when removed; individual sand grains coated with clay; pH 5.0 to 5.5; 6 to 10 inches thick; diffuse lower boundary.

C_1 44 inches +, dark grayish-brown (10YR 4/2) loamy fine sand high in shale; single grain; loose and friable; low water-holding capacity; pH 5.0 to 5.5.

Range in characteristics: The texture of the surface soil ranges from coarse sandy loam to fine sandy loam. Lenses of coarse shaly sand occur in various places throughout the profile. In some places the soil is fine sand or fine sandy loam to depths of 10 feet or more. Near Talcottville in the town of Leyden, layers of very fine sand and silt underlie the fine sand at depths between 15 and 20 feet.

Relief: Nearly level to steeply sloping. The slopes are dominantly less than 15 percent, but short, steep slopes of as much as 35 percent occur on the breaks adjoining streams.

Drainage: Good. Surface runoff is medium and internal drainage is rapid.

Native vegetation: Hard maple, beech, basswood, white ash, black cherry, and hophornbeam.

MAPPING UNITS

The following mapping units are in the Colonie series:

Colonie fine sandy loam, 0 to 3 percent slopes (CcA; Group 2).
Colonie fine sandy loam, 3 to 8 percent slopes (CcB; Group 4).
Colonie fine sandy loam, 8 to 15 percent slopes (CcC; Group 15).
Colonie fine sandy loam, 15 to 35 percent slopes (CcD; Group 27).—Because of the steep slopes, this soil is shallow; the depth varies, however. In some areas the profile is similar to that of the typical soil, but the layers are not so thick. In others there is little profile development and the soil consists of stratified fine and medium sands that overlie silt.

Colosse Series

The soils of the Colosse series have developed on glacial outwash composed mainly of sandstone but containing small amounts of gray shale. The soils occur in the Tug Hill section of the county.

The Colosse soils are somewhat similar to the Colton soils that have developed on coarse-textured materials derived from granite and gneiss. The Colton soils are mainly east of the Black River. The well-drained to excessively drained Colosse is the only member of its catena mapped in the county. The Colosse soils belong to the Podzol great soil group.

Typical profile (Colosse gravelly sandy loam—undisturbed):

A_0 4 to 0 inches, black humus matted with fine roots; pH 3.8 to 4.2; 2 to 5 inches thick.

A_2 0 to 2 inches, reddish-gray (5YR 5/2) loamy sand; weak fine crumb structure; very friable; pH 4.2 to 4.5; 1 to 3 inches thick; abrupt lower boundary.

B_{2h} 2 to 3 inches, very dusky red (2.5YR 2/2) coarse loamy sand weakly cemented with precipitated organic matter; breaks easily; single grain or fine crumb structure; pH 4.2 to 4.4; 1 to 2 inches thick; clear lower boundary.

B_{2ir} 3 to 9 inches, dark-red (2.5YR 3/6) loamy coarse sand that is strongly cemented; breaks to coarse blocks that crush to single grain; very low water-holding capacity; pH 5.0 to 5.2; 4 to 8 inches thick; gradual lower boundary.

B_{22} 9 to 20 inches, reddish-brown (5YR 4/4) to yellowish-red (5YR 4/6) cobbly loamy sand; nearly structureless; loose, open, and porous; pH 5.0 to 5.2; 8 to 14 inches thick; gradual lower boundary.

C_1 20 to 72 inches, yellowish-brown (10YR 5/6) mixed sand and gravel; loose and open; structureless; gravel is mainly gray sandstone, but some is red Medina sandstone; pH 5.0 to 5.5; very low water-holding capacity; 4 to 10 feet thick; diffuse lower boundary.

C_2 72 inches +, loose, stratified sand, gravel, and cobbles that are coated with carbonates on the upper parts; in many places tightly cemented at depths between 8 and 10 feet.

Range in characteristics: In some places in the southwestern part of the county, these soils are formed mainly from reddish sandstone. Here, the surface soil and the subsoil are a pinkish color. On the northern and eastern edges of Tug Hill, the soils are made up of shale mixed with fragments of sandstone and the color is grayish to yellowish brown. The texture of the soils ranges from cobbly loamy sand to nongravelly fine sandy loam. The typical soil is gravelly sandy loam and is droughty.

The well-developed A_2 horizon described in the typical soil is not present in all areas. It occurs in most places in the cobbly soils. In places the A_2 horizon is absent in the gravelly fine sandy loams. The soils are very strongly acid in the upper horizons, but they are cemented by carbonates in many places at depths between 8 and 10 feet.

Relief: Nearly level on terraces; short, moderate to steep slopes between benches of different levels and the kames.

Drainage: Good to excessive. Surface runoff is slow, even on the steep slopes. The water-holding capacity is very low.

Native vegetation: Hard maple, beech, black cherry, and some hemlock and white pine.

MAPPING UNITS

The following mapping units are in the Colosse series:

Colosse gravelly fine sandy loam, 2 to 8 percent slopes (CeB; Group 23).—Except that the parent materials of this soil are not so coarse and contain more shale, this soil is similar to the typical soil described for the series. Most of it is on the eastern edge of the Tug Hill Plateau. It is the best soil for agriculture of any in the series.

Colosse cobbly loamy fine sand, 2 to 8 percent slopes (CdB; Group 23).—This soil lies along Salmon River and the east branch of Fish Creek between West Leyden and Osceola. It is droughty and not suitable for agriculture. Much of it has been abandoned or is in forest.

Colosse cobbly loamy fine sand, 8 to 15 percent slopes (CdC; Group 24).

Colosse soils, 15 to 45 percent slopes (CfD; Group 42).—This soil occupies kames, steep slopes between terraces of different levels, and the breaks along streams. It is not suitable for agriculture, but some is used for permanent pasture. Some of the soil has been abandoned, and some is in forest.

Colton Series

The soils of the Colton series are well drained to excessively drained. They have developed on sandy and gravelly glacial outwash and deltaic deposits derived chiefly from gneiss and granite. They occur mainly east of the Black River.

These soils are in the same catena as the moderately well drained Duane soils, the poorly drained Walpole soils, and the very poorly drained Scarboro soils. They are in the same association as the Gloucester soils and their associates that also have developed on glacial till derived from similar parent material. The Colton soils are Podzols.

Typical profile (Colton loamy fine sand—undisturbed):

A_0 4 to 0 inches, thin forest litter over a black (10YR 2/1), greasy mor humus layer; fine crumb structure; pH 3.8 to 4.0; 2 to 6 inches thick.

A_2 0 to 3 inches, pinkish-gray (7.5YR 6/2) loamy sand; weak fine crumb structure; very friable; pH 4.0 to 4.2; 2 to 4 inches thick; abrupt lower boundary.

B_{2h} 3 to 5 inches, dark reddish-brown (5YR 3/2) loamy sand very high in precipitated organic matter; weak fine crumb structure; layer is not continuous and is more highly developed under coniferous cover; pH 4.0 to 4.5; 1 to 3 inches thick; clear lower boundary.

B_{2ir} 5 to 8 inches, dark-red (2.5YR 3/6) loamy sand; slightly cemented in place but, when removed, breaks to firm irregular lumps that are easily crushed; medium to fine crumb structure; contains much fine gravel; cementation is not continuous and ranges from weak to strong; pH 4.2 to 4.6; 2 to 5 inches thick; gradual lower boundary.

B_{2ir2} 8 to 15 inches, reddish-brown (5YR 4/4) coarse loamy sand; coherent in place but friable when removed; very weak coarse crumb structure or single grain; pH 4.5 to 5.0; 6 to 10 inches thick; gradual lower boundary.

B_3 15 to 27 inches, strong-brown (7.5YR 5/6) loamy sand to coarse sand; contains much fine gravel; very weak fine crumb structure to single grain; loose to friable; very low water-holding capacity; pH 4.5 to 4.8; 10 to 15 inches thick; diffuse lower boundary.

C 27 inches+, yellowish-brown (10YR 5/4) loose, porous, fine to coarse sand that contains gravel and cobbles; derived from gneiss and granite; pH 4.8 to 5.0.

Range in characteristics: In cultivated areas the upper horizons have been mixed by plowing and are grayish brown. The texture of the soil ranges from loamy fine sand to gravelly loamy sand or cobbly loamy sand. The A_2 and B_{2h} horizons vary in thickness. In some places, where the forest cover is mostly mixed hardwoods, these horizons are very thin. In places where the A_2 and B_{2h} horizons are strongly developed, the B_{2ir} layer is cemented. The amount of gravel in the upper layers varies, but in all the areas gravel occurs in the substratum. These soils become coarser textured with depth.

Relief: Nearly level to steep. The outwash plains and flat-topped deltas are nearly level. The slopes are steep on delta fronts, on the breaks between different terrace levels, and on the rough kames.

Drainage: There is very little surface runoff, even on the steep slopes. Practically all drainage is through the soil. The sandier soils are well drained, and the gravelly and cobbly soils are excessively drained.

Native vegetation: Hard maple, beech, black cherry, white pine, and hemlock. In cutover areas there are gray birch and aspen trees.

MAPPING UNITS

The following mapping units are in the Colton series:

Colton loamy fine sand, 0 to 3 percent slopes (ChA; Group 23).

Colton loamy fine sand, 3 to 8 percent slopes (ChB; Group 23).

Colton loamy fine sand, 8 to 15 percent slopes (ChC; Group 24).

Colton gravelly loamy sand, 0 to 8 percent slopes (CgB; Group 23).

Colton gravelly loamy sand, 8 to 15 percent slopes (CgC; Group 24).

Colton loamy sand and cobbly loamy sand, 15 to 25 percent slopes (CkD; Group 42).—All of the soils that have slopes of 15 to 25 percent were combined in this undifferentiated soil group.

Colton loamy sand and cobbly loamy sand, 25 to 45 percent slopes (CkE; Group 42).

Colton soils, 0 to 15 percent slopes, severely blown (CmS; Group 42).—These soils have been eroded severely by wind. All of the fine sand has been removed, and it now forms dunes at the edges of the areas. Gravel, cobbles, and coarse sand are left. These areas support little vegetation and are hard to stabilize. If the areas are planted to trees, they will need protection to prevent further blowing so that the seedlings can become established. Brush or trash, placed over the areas after the seedlings are planted, is helpful.

Colton and Adams soils, 15 to 35 percent slopes, severely blown (CnS; Group 42).—This mapping unit is made up of Colton gravelly and cobbly sands and of the Adams fine sands that are free of gravel. The soils are steep and are wind eroded. Blownout areas are beginning to form, and if the soils are not stabilized these areas will increase rapidly in size.

Croghan Series

The soils of the Croghan series are moderately well drained to somewhat poorly drained. They have developed on deltaic sands derived mainly from gneiss and granite.

These soils are in the same catena as the well-drained Adams soils, the poorly drained to somewhat poorly drained Saugatuck soils, and the very poorly drained Scarboro soils. Except that they have a more strongly developed profile and a subsoil that is mottled, they are similar to the Adams soils. The Croghan soils are Podzols.

Typical profile (Croghan loamy fine sand—undisturbed):

A_0 4 to 0 inches, black mor humus matted with fine roots; pH 3.8 to 4.0; 3 to 8 inches thick; abrupt lower boundary.

A_2 0 to 3 inches, pinkish-gray (7.5YR 7/2) loamy fine sand; weak fine crumb structure to single grain; very friable to loose; pH 4.0 to 4.2; 3 to 6 inches thick; abrupt lower boundary.

B_{2h} 3 to 5 inches, black (2.5Y 2/0) to dark reddish-brown (5YR 3/2) fine sand; very high in organic matter; friable; breaks to medium-sized rounded lumps that have a fine crumb structure; pH 4.0 to 4.2; 1 to 3 inches thick; clear lower boundary.

B_{2ir} 5 to 16 inches, dark reddish-brown (5YR 3/4) loamy sand that is strong brown (7.5YR 5/6) in lower part; weak fine crumb structure to single grain; strongly cemented to a hard, massive ortstein in places in the upper part of layer; where distinct ortstein is not present, there are many cemented aggregates that are the size of small pebbles; pH 2.4 to 4.4; 8 to 14 inches thick; gradual lower boundary.

B_3 16 to 30 inches, yellowish-brown (10YR 5/8) loose loamy sand; a few coarse, prominent mottles of strong brown (7.5YR 5/8); 12 to 18 inches thick; diffuse lower boundary.

C 30 inches +, light yellowish-brown (10YR 6/4) loamy sand or fine sand; single grain; firm in place; rests on loose, open fine sand that is 5 to 10 feet thick; below this, stratified sand and gravel or silt and clay occur in places; pH 5.2 to 5.4.

Range in characteristics: The texture of the surface layer ranges from loamy fine sand to loamy sand. The cementation in the B horizons varies within short distances, the range being from strongly cemented massive layers to iron-cemented aggregates of gravel size. The soil is generally very strongly acid, but in some places the substratum has a pH of 6.0.

Relief: Nearly level to gently undulating; dominantly 2 to 3 percent.

Drainage: Moderately good. Permeability is rapid but the water table is high.

Native vegetation: Hard maple, beech, hemlock, and white pine.

MAPPING UNIT

The following is the only member of the Croghan series mapped in this county:

Croghan loamy fine sand, 0 to 5 percent slopes (CoB; Group 25).—Included with this soil in mapping are some small areas of poorly drained Saugatuck soil.

Dover Series

The soils of the Dover series are well drained and are medium textured. They have developed from glacial till derived mainly from crystalline limestone.

Like the Nellis soils, these soils are in the same catena as the moderately well drained to somewhat poorly drained Amenia soils, the poorly drained to somewhat poorly drained Kendaia soils, and the very poorly drained Lyons soils, and they occur in association with these soils. The Dover soils are redder and coarser in texture than the Nellis soils. They occur in association with the Bonaparte soils, which were formed from glacial outwash, also derived from crystalline limestone. The soils of the Dover series belong to the Brown Forest great soil group.

Typical profile (Dover stony loam—undisturbed):

A_1 0 to 5 inches, very dark brown (10YR 2/2) stony loam to light silt loam; moderate to strong fine crumb structure; very friable; pH 6.2 to 6.5; 4 to 6 inches thick; clear lower boundary.

B_{21} 5 to 9 inches, brown to dark-brown (7.5YR 4/4) stony loam; weak or moderate fine subangular blocky structure, but breaks easily to very fine crumb; very friable and open in place; pH 6.2 to 6.5; 3 to 5 inches thick; gradual lower boundary.

B_{22} 9 to 22 inches, yellowish-red (5YR 4/8) to dark-brown (7.5YR 4/4) stony loam; moderate fine to medium subangular blocky structure, but breaks easily to fine crumb; very friable in place; contains many roots; pH 6.5 to 6.8; 11 to 15 inches thick; gradual lower boundary.

B_{23} 22 to 30 inches, dark reddish-brown (5YR 3/4) gritty stony loam; weak medium subangular blocky structure, but breaks to fine crumb; very friable and open in place; coarse fragments of crystalline limestone and gneiss make up about one-fourth of the volume; pH 7.0 to 7.5; 6 to 10 inches thick; diffuse lower boundary.

C 30 inches +, a thick, coarse mixture of calcite crystals, granite pebbles, and crystalline igneous stones in a matrix of light brownish-gray (2.5Y 6/2) gritty loam; contains many large boulders of crystalline limestone and gneiss; loose and open in place; low water-holding capacity; readily penetrated by roots; calcareous.

Range in characteristics: The thickness of the soil ranges from 2 to 10 feet within short distances. The texture ranges from stony to very stony. Typically, fragments of the limestone, from which the soil formed, disintegrate to a sugarlike mass of white or light-gray crystals of calcite. These crystals are of the size of sand or gravel and are conspicuous in the lower part of the profile. In some places darker colored and less highly crystalline limestone predominates. The amount of calcite varies. It ranges from abundant where the soil occurs near rock outcrops to none where the soil is transitional to the Gloucester soils.

Relief: Dominantly rolling to strongly sloping; slopes are mainly 8 to 15 percent.

Drainage: Good. Surface runoff is medium to rapid. Internal drainage is medium in the less stony areas to very rapid in the very stony areas.

Native vegetation: Mainly hard maple, beech, black cherry, and basswood.

MAPPING UNITS

The following mapping units are in the Dover series:

Dover stony loam, 3 to 8 percent slopes (DaB; Group 3).
Dover stony loam, 8 to 15 percent slopes (DaC; Group 14).
Dover very stony loam, 3 to 15 percent slopes (DbB; Group 38).
Dover very stony loam, 15 to 35 percent slopes (DbD; Group 41).

Duane Series

The soils of the Duane series are moderately well drained. They have developed on glaciofluvial materials derived mainly from gneiss and granite. The soils occur on terraces, or benches, or at the bases of slopes.

These soils are in the same catena as the well-drained Colton soils, the poorly drained Walpole soils, and the very poorly drained Scarboro soils. Except that mottling occurs in the lower part of the B horizon, they are similar to the Colton soils. In contrast to the Croghan soils, which were also formed from gneiss and granite, the Duane soils have gravel throughout the profile. The soils of the Duane series are Podzols.

Typical profile (Duane sandy loam—undisturbed):

A_0 2 to 0 inches, thin forest litter overlying black mor humus layer; matted with fine roots; pH 4.0 to 4.2; 2 to 4 inches thick; abrupt lower boundary.

A_2 0 to 3 inches, gray (10YR 6/1) or pinkish-gray (7.5YR 6/1) loamy sand; single grain; very friable; pH 4.0 to 4.2; 2 to 4 inches thick; abrupt lower boundary.

B_{21} 3 to 10 inches, yellowish-red (5YR 4/6) to reddish-brown (5YR 4/3) loamy sand and fine gravel; weak fine crumb structure; slight cementation or pebble-sized iron concretions in places; pH 4.5 to 5.0; 6 to 8 inches thick; clear lower boundary.

B_{22} 10 to 16 inches, strong-brown (7.5YR 5/8) gravelly loamy sand; has a few faint mottles of yellowish red; weak fine to medium crumb structure; loose and open in place; pH 5.0 to 5.5; 5 to 8 inches thick; gradual lower boundary.

B_3 16 to 26 inches, yellowish-brown (10YR 5/6) gravelly medium sand; distinct mottles of strong brown; single grain; loose and open in place; pH 5.2 to 5.5; 8 to 12 inches thick; diffuse lower boundary.

C 26 inches +, light yellowish-brown (10YR 6/4) to yellowish-brown (10YR 5/4) medium to coarse sand and gravel stained with strong brown; single grain; loose, open, and porous in place; rests on stratified deposits of sand, gravel, and cobbles; pH 5.3 to 5.5.

Range in characteristics: The texture of the surface soil ranges from fine sandy loam to sandy loam. In some places the soil is gravelly and in others it is nongravelly, but in all the areas gravel occurs in the substratum. In places the water table is high and drainage is restricted. At depths below 36 inches, on the higher benches or terraces, layers of compact silt and fine sand retard the movement of water through the soil.

Relief: Level to slightly depressed; dominantly 0 to 3 percent slopes.

Drainage: Moderately good. Surface runoff is slow, and internal drainage is medium to slow.

Native vegetation: Northern hardwoods; hard maple, beech, yellow birch, white pine, and hemlock.

MAPPING UNIT

The following is the only member of the Duane series mapped in this county:

Duane sandy loam, 0 to 5 percent slopes (DcB; Group 25).—Except that in cultivated areas the upper horizons have been mixed by plowing and the surface layer is grayish brown in color and 8 inches thick, this soil is similar to the typical soil described for the series.

Eel Series

The soils of the Eel series are moderately well drained to somewhat poorly drained. They occur on stream bottoms and are developing from recent alluvium that has washed from upland soils formed from alkaline or

calcareous glacial drift. These soils occur along streams that traverse the uplands in areas where soils of the Nellis catena predominate.

The Eel soils are in the same catena as the well-drained Genesee soils, the poorly drained to somewhat poorly drained Wayland soils, and the very poorly drained Sloan soils. They are in the Alluvial great soil group.

Typical profile (Eel silt loam—undisturbed):

A_1 0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; strong medium crumb structure; friable; high in organic matter; pH 6.2 to 6.5; 6 to 10 inches thick; clear lower boundary.

A_{12} 8 to 15 inches, grayish-brown (10YR 5/2) light silt loam; moderate fine to medium crumb structure; friable; pH 6.3 to 6.6; 5 to 8 inches thick; gradual lower boundary.

A_{13} 15 to 24 inches, brown (10YR 5/3) silt loam; many distinct mottles of gray and strong brown; weak fine crumb structure; slightly firm in place; pH 6.5 to 7.0; 8 to 12 inches thick; diffuse lower boundary.

C 24 inches +, pale-brown (10YR 6/3) to brown (10YR 5/3) slightly firm silt loam; has a few large mottles of strong brown and grayish brown; variable in texture and in places contains lenses and beds of gravel.

Range in characteristics: Along the smaller streams, the texture of the surface soil and subsoil ranges from silt loam to fine sandy loam within short distances. In places the surface soil contains gravel. Lenses and beds of gravel occur in many places at depths greater than 2 feet.

Relief: Level.

Drainage: Moderately good, but soils are subject to periodic flooding. The naturally high water table restricts drainage.

Native vegetation: Soft maple, elm, white ash, willow, and alder.

MAPPING UNIT

The following is the only member of the Eel series mapped in Lewis County.

Eel silt loam, 0 to 2 percent slopes (EaA; Group 12).

Elmwood Series

The soils of the Elmwood series are moderately well drained to somewhat poorly drained. They have developed on deltaic deposits of gravel-free, fine- to medium-textured sand. The sand is 18 to 36 inches deep and overlies lake-laid silt and clay.

The soils are in the same catena as the well-drained Melrose soils, the poorly drained to somewhat poorly drained Swanton soils, and the very poorly drained Whately soils. They are also associated with the Buxton and Scantic soils, but in most places they occur at higher elevations. They are coarser textured than the Hartland soils that have formed from similar materials. The soils of the Elmwood series are weak Podzols.

Typical profile (Elmwood sandy loam—cultivated):

A_p 0 to 8 inches, dark-brown (10YR 4/3) coarse sandy loam; moderate to strong medium to fine crumb structure; friable; pH 5.2 to 5.4; 6 to 9 inches thick; clear lower boundary.

B_{21} 8 to 12 inches, strong-brown (7.5YR 5/6 to 5/8) coarse sandy loam; weak fine crumb structure; slightly firm in place; friable when crushed; pH 5.3 to 5.5; 3 to 5 inches thick; gradual lower boundary.

B_{2g} 12 to 20 inches, yellowish-brown (10YR 5/6) coarse sandy loam; common, faint mottles of strong brown (7.5YR 5/6 to 5/8); weak fine crumb structure; slightly firm to firm in place; pH 5.2 to 5.4; 7 to 10 inches thick; abrupt lower boundary.

D_1 20 to 36 inches, light-brown (7.5YR 6/4) silt; many medium mottles of strong brown (7.5YR 5/8); moderate medium subangular blocky structure; firm when moist and very hard when dry; pH 5.6 to 5.8; 12 to 24 inches thick; diffuse lower boundary.

D_2 36 inches+, yellowish-brown (10YR 5/6) silty clay; vertical streaks of light brown (7.5YR 6/4); root channels have a light-gray coating of clay; weak to moderate angular blocky structure; firm when moist, hard when dry, and plastic and sticky when wet; pH 5.8 to 6.2.

Range in characteristics: The texture of the surface layer ranges from fine sandy loam to coarse sandy loam, but sandy loam predominates. The depth to the silty clay substratum ranges from 18 to 36 inches.

Relief: Nearly level to gently or moderately sloping; the dominant range is 2 to 6 percent.

Drainage: Moderately good. Surface runoff is medium, but the silty clay substratum retards movement of water through the soil.

Native vegetation: Hard maple, beech, yellow birch, hemlock, and white pine.

MAPPING UNIT

The following is the only member of the Elmwood series mapped in this county:

Elmwood sandy loam, 0 to 6 percent slopes (EbB; Group 8).

Empeyville Series

The soils of the Empeyville series are moderately well drained to somewhat poorly drained. They have formed from glacial till consisting mainly of Oswego sandstone but containing some shale and igneous rock. The soils have a strongly developed fragipan at depths below 18 inches. They are extensively developed throughout the Tug Hill Plateau area.

These soils are in the same catena as the well-drained Worth soils, the somewhat poorly drained to poorly drained Westbury soils, and the very poorly drained Tughill soils. The Empeyville soils are Podzols.

Typical profile (Empeyville stony loam—undisturbed):

A_0 4 to 0 inches, black mor humus layer matted with fine roots; pH 3.8 to 4.2; 3 to 5 inches thick.

A_2 0 to 2 inches, pinkish-gray (5YR 6/2) stony very fine sandy loam; slightly firm in place but friable when removed; weak fine crumb structure; pH 4.2 to 4.5; 2 to 4 inches thick; abrupt lower boundary.

B_{21} 2 to 6 inches, yellowish-red (5YR 4/6) stony very fine sandy loam; very weak subangular blocky structure; aggregates break readily and then have moderate fine to very fine crumb structure; pH 4.6 to 4.8; 2 to 4 inches thick; clear lower boundary.

B_{22} 6 to 15 inches, brown (7.5YR 5/4) to dark-brown (7.5YR 4/4) stony very fine sandy loam to sandy loam; very weakly defined coarse aggregates that, if broken, have a fine crumb structure; firm in place; about 10 percent consists of coarse, angular sandstone fragments; pH 5.0 to 5.2; 7 to 10 inches thick; gradual lower boundary.

B_3 15 to 21 inches, yellowish-brown (10YR 5/4) stony fine sandy loam; common distinct mottles of strong brown (7.5YR 5/6 to 5/8); weak medium subangular fragments that, if broken, have a fine crumb structure; pH 5.2 to 5.4; 5 to 8 inches thick; clear to gradual lower boundary.

A'_2 21 to 25 inches, grayish-brown (2.5Y 5/2) stony fine sandy loam with a few olive-colored mottles; moderate to strong thick platy structure but breaks to firm, brittle, medium blocks; very dense and hard in place

so that roots cannot penetrate; pH 5.2 to 5.4; 4 to 8 inches thick; gradual lower boundary.

B'$_2$ 25 to 40 inches, brown (10YR 5/3) stony sandy loam; faint mottles of gray and yellowish brown; weak medium blocky structure; very firm and hard in place; pH 5.4 to 5.5.

Range in characteristics: In cultivated areas the first three layers have been mixed by plowing. Here, the soil has a brown or light grayish-brown surface layer of stony loam. The amount of stone on the surface varies, but the layers beneath the surface are normally stony. In cultivated areas the stones have been removed from the surface and stacked in large piles. The depth to the fragipan (A' and B' horizons) ranges from 18 to 24 inches. Where the soils of the Worth catena are transitional to soils of the Pinckney catena, some of the soils of the Worth catena have been mapped with the Empeyville soils. These included soils are flaggy, contain more shale, and are somewhat heavier in texture than the stony types of the Empeyville soils.

Relief: Undulating to rolling or sloping.

Drainage: Moderately good. Surface runoff is medium to rapid, but drainage through the soil is very slow because of the extreme density of the fragipan.

Native vegetation: Hard maple, beech, yellow birch, black cherry, white pine, hemlock, spruce, and balsam fir.

MAPPING UNITS

The following mapping units are in the Empeyville series:

Empeyville stony loam, 3 to 8 percent slopes (EdB; Group 10).

Empeyville stony loam, 8 to 15 percent slopes (EdC; Group 18).

Empeyville very stony loam, 3 to 15 percent slopes (EeC; Group 38).—This soil occurs in areas of rough relief. In many places the difference between this soil and the stony phases is only that large amounts of stone have been removed from the stony soil. There are many stone fences between the fields and many piles of stones. This soil is not cultivated, but in places it is used for permanent pasture.

Empeyville flaggy silt loam, 3 to 8 percent slopes (EcB; Group 10).—This soil has formed where the amount of sandstone in the parent material is less than in the typical soil and the amount of shale increases. Except that the soil is not so stony, has a heavier texture, and is slightly less acid, it is similar to the stony loam type described for the series. It occurs on the outer edges of the Tug Hill Plateau, mainly in the vicinity of Mohawk Hill and West Leyden.

Empeyville flaggy silt loam, 8 to 15 percent slopes (EcC; Group 18).

Essex Series

The soils of the Essex series are well drained. They have strongly expressed fragipans. The soils have developed on sandy and stony glacial till derived mainly from gneiss and granite. They occur mainly east of the Black River on the uplands between the river and the sand plain.

These soils are in the same catena as the moderately well drained Scituate soils, the poorly drained Ridgebury soils, and the very poorly drained Whitman soils. The Essex soils are associated with the Gloucester soils and have formed from similar parent material. The Gloucester soils, however, do not have a fragipan and have a loose and friable substratum. The Essex soils are similar to the Becket soils, which have formed from similar parent material and also have fragipans. Essex soils are weak Podzols, whereas the Becket soils are strong Podzols.

Typical profile (Essex stony fine sandy loam—undisturbed):

A$_0$ 2 to 0 inches, deciduous forest litter overlying a black to very dark brown mixture of organic material; pH 5.0 to 5.3; 1 to 3 inches thick; abrupt lower boundary.

A$_1$ 0 to 4 inches, grayish-brown (10YR 5/2) to yellowish-brown (10YR 5/4) stony loam; contains much sharp coarse sand and many small fragments of gneiss; slightly firm in place; friable when removed; weak fine crumb structure; pH 5.2 to 5.5; 3 to 5 inches thick; clear lower boundary.

B$_{21}$ 4 to 12 inches, strong-brown (7.5YR 5/8) gritty stony loam; weak medium to fine crumb structure; very friable; rapidly permeable; pH 5.0 to 5.5; 6 to 10 inches thick; gradual lower boundary.

B$_{22}$ 12 to 20 inches, yellowish-brown (10YR 5/6) gritty stony loam; weak medium to fine crumb structure; friable; contains much coarse sand and many large stones of Adirondack gneiss; rapidly permeable; pH 5.4 to 5.6; 6 to 10 inches thick; gradual lower boundary.

B'$_{21}$ 20 to 34 inches, brown (10YR 5/3) sandy loam; weak to moderate thick platy structure; firm to very firm; very stony; slowly permeable; pH 5.4 to 5.6; 12 to 18 inches thick; gradual lower boundary.

B'$_{22}$ 34 to 45 inches, light olive-brown (2.5Y 5/4) coarse sandy loam; strong medium platy structure; firm when moist, and very hard when dry; dense in place; very stony and bouldery; pH 5.4 to 5.6.

C 45 inches+, grayish-brown (10YR 5/2) very stony sandy loam to coarse sandy loam till; firm to moderately firm in place; weak thick platy structure that fades out with depth; permeable; pH 5.4 to 5.6.

Range in characteristics: In cultivated areas the plow layer is brown to dark brown. Depth to the fragipan (B' horizons) ranges from 18 to 30 inches, and the thickness of the pan ranges from 12 to 36 inches. The texture is normally fine sandy loam, but coarse sandy loam occurs in many places.

Relief: Gently sloping to steeply sloping hillsides; slopes range from 3 to 25 percent, but the dominant slopes are 8 to 15 percent.

Drainage: Good. Surface runoff is medium to rapid, and internal drainage is medium to slow.

Native vegetation: Hard maple, beech, yellow birch, black cherry, and some hemlock and white pine.

MAPPING UNITS

The following mapping units are in the Essex series:

Essex stony fine sandy loam, 3 to 8 percent slopes (EfB; Group 5).

Essex stony fine sandy loam, 8 to 15 percent slopes (EfC; Group 16).

Essex stony fine sandy loam, 15 to 25 percent slopes (EfD; Group 28).

Fonda Series

The soils of the Fonda series are very poorly drained. They have developed on heavy-textured, alkaline to calcareous glacial till. The till was derived from dark shale mainly, with some limestone.

The soils are in the same catena as the well drained Mohawk soils, the moderately well drained to somewhat poorly drained Manheim soils, and the poorly drained to somewhat poorly drained Ilion soils. The Fonda soils also are in the Poland-Turin-Ilion catena. The soils of the Fonda series belong to the Humic Gley great soil group.

Typical profile (Fonda silt loam—undisturbed):

A$_1$ 0 to 6 inches, black (10YR 2/1) to very dark brown (10YR 2/2) silt loam; strong medium crumb structure; slightly sticky and plastic when wet; pH 6.3 to 6.5; 5 to 8 inches thick; abrupt lower boundary.

A_2G 6 to 10 inches, gray (10YR 5/1) silt loam; massive to weak medium blocky structure; firm when moist and hard when dry; plastic and sticky when wet; dense in place; root and worm channels filled with black material from the surface; pH 6.3 to 6.7; 3 to 5 inches thick; clear lower boundary.

B_{21g} 10 to 15 inches, brownish-yellow (10YR 6/8) to yellowish-brown (10YR 5/8) silty clay loam with mottles of reddish yellow (7.5YR 6/8), gray (10YR 6/1), and light brownish gray (10YR 6/2); weak medium blocky structure; peds coated with gray; firm when moist; sticky and plastic when wet; pH 6.5 to 6.8; 4 to 7 inches thick; gradual lower boundary.

B_{22g} 15 to 24 inches, silty clay loam mottled yellowish brown (10YR 5/8), gray (10YR 6/1), and pale brown (10YR 6/3), the value of the colors being about equal; weak medium blocky structure; firm when moist; sticky and plastic when wet; pH 7.0 to 7.5; 8 to 12 inches thick; diffuse lower boundary.

C 24 inches +, light yellowish-brown (10YR 6/4) silty clay loam mottled with brown and gray; moderate coarse blocky structure; nodules of lime occur, and lime accumulates in the root channels; firm in place and sticky and plastic when wet. The substratum is heavy glacial till derived from soft shale and limestone.

Range in characteristics: In places where the parent material is made up mainly of black shale and limestone, the surface soil is neutral and the subsoil is calcareous. The soil in these places is associated with Mohawk and Manheim soils. Where the parent material is mainly sandstone, the soil is moderately acid. In these areas the soil is associated with Poland and Turin soils. The color of the surface soil ranges from black to very dark gray, and the color of the subsoil, from dark grayish brown to dark gray. The color varies with the amount of black shale in the parent material.

Relief: Flat to depressed; on gentle to moderate slopes, as seepage spots.

Drainage: Very poor.

Native vegetation: Soft maple, elm, willow, and alder.

MAPPING UNIT

The following is the only member of the Fonda series mapped in this county:

Fonda silt loam, 0 to 3 percent slopes (FaA; Group 33).

Fresh Water Marsh

This mapping unit is made up of swampy areas that are always under water. The areas occur around ponds and lakes. Where the water is shallow enough, cattails, rushes, sedges, and swamp grasses grow. In some places the soil material is fibrous peat. In others it is made up of highly organic mineral material.

Fresh water marsh is not suitable for agriculture. The areas are too wet for pasture and are best used as habitats for wildlife or for recreational purposes.

MAPPING UNIT

Fresh water marsh (FbA; Group 44).

Gage Series

The soils of the Gage series are poorly drained. They have a strongly gleyed compact horizon, or fragipan, that overlies a pronounced, gleyed A_2 horizon. The soils have formed from till of Late Wisconsin age. The till was made up mainly of gray to dark-gray shale and sandstone.

The soils are associated with the soils of the catena in which there are the well drained Pinckney soils, the moderately well drained to somewhat poorly drained Camroden soils, the poorly drained Marcy soils, and the somewhat poorly drained Alden soils. The Gage soils occupy the same position in this catena as the Marcy soils. The Gage soils have more strongly expressed gleyed horizons than the Marcy soils and a more acid solum. They are associated with the more acid Camroden and Pinckney soils. The soils of the Gage series are in the Low-Humic Gley great soil group.

Typical profile (Gage silt loam—in pasture):

A_{1p} 0 to 6 inches, dark-gray (2.5Y 4/1) silt loam; strong-brown mottles along root channels; moderate medium crumb structure; friable; pH 4.0 to 4.5; 5 to 8 inches thick; abrupt lower boundary.

$A_{21}G$ 6 to 10 inches, nearly white (5Y 8/2 to 7/2) when dry and light-gray (5Y 7/2) to light olive-gray (5Y 6/2) when moist silt loam to loam; few to many medium mottles of strong brown (7.5YR 5/8); weak thin and medium platy structure; slightly firm; pH 4.5 to 4.8; 3 to 5 inches thick; clear lower boundary.

$A_{22}G$ 10 to 15 inches, light-gray (5Y 7/2) loam or silt loam; coarse to very coarse columnar structure; the tops of columns have caps ½ to 1 inch thick, and the interiors are mottled light olive brown (2.5Y 5/6) on a light-gray (5Y 7/2 or 2.5Y 7/2) base; slightly firm to firm; pH 4.5 to 5.0; 4 to 6 inches thick; gradual lower boundary.

B_2G 15 to 25 inches, silty clay loam; compound weak coarse and very coarse prismatic and weak fine and medium blocky structure; outside of prisms has a gray (5Y 5/1) coating; interiors mottled in equal parts with yellowish brown (10YR 5/6) and light olive brown (2.5Y 5/3); the block faces are gray (5Y 5/1), but coloring is not continuous; very firm; pH 5.0 to 5.4 in upper part to 5.5 to 6.0 in places in lower part; 8 to 12 inches thick; gradual lower boundary.

B_3G 25 to 40 inches, silt loam to silty clay loam; weak very coarse prismatic structure; prisms are gray (5Y 5/1) coated, and the interiors are light olive brown (2.5Y 5/3) to olive brown (2.5Y 4/3); yellowish-brown and gray mottles; very firm but becomes less firm with depth; pH 5.6 to 6.0; 12 to 20 inches thick; diffuse lower boundary.

C_g 40 inches+, olive-brown (2.5Y 4/4) to light olive-brown (2.5Y 5/3) silt loam to silty clay loam; yellowish-brown mottles that become less numerous with depth; weak medium angular blocky structure; blocks crudely arranged in plates; firm; pH 6.0 to 6.5 and becomes less acid with depth.

Range in characteristics: The texture of the surface layer ranges from a typical silt loam to a heavier textured silt loam. The color of the soil varies according to the amount of sandstone and dark- or light-colored shale in the soil. Typically, the soil is strongly acid, but it becomes less acid with depth. Except where lime has been added, the A_{1p} layer is extremely acid.

Relief: Nearly level to depressed; some very gently sloping areas that receive water from surrounding slopes.

Drainage: Poor. Surface runoff is slow and internal drainage is very slow.

Native vegetation: Elm, soft maple, beech, hard maple, hemlock, white pine, red spruce, and balsam fir.

MAPPING UNITS

The following mapping units are in the Gage series:

Gage silt loam, 0 to 3 percent slopes (GbA; Group 30).

Gage silt loam, 3 to 8 percent slopes (GbB; Group 19).

Gage silt loam, shallow, 0 to 8 percent slopes (GaB; Group 32).—This soil has acid shale bedrock at depths between 20 and 30 inches. No free water passes through the soil, and the soil is seepy after heavy rains. The surface horizon is dark gray, and

the subsoil is silty clay to clay that is prominently mottled. This soil lacks the strongly gleyed, light-gray layer described for the typical soil.

Galen Series

The soils of the Galen series are moderately well drained. They have developed on deltaic deposits of alkaline fine sands. They occur west of the Black River on sediments that were washed from areas of shale and limestone.

These soils are in the same catena as the well-drained Petoskey soils, the somewhat poorly drained to poorly drained Junius soils, and the very poorly drained Granby soils. The soils of the Galen series are in the Brown Forest great soil group.

Typical profile (Galen fine sandy loam—undisturbed):

A_1 0 to 5 inches, very dark brown (10YR 2/2) fine sandy loam; weak fine crumb structure; very friable; pH 5.8 to 6.0; 4 to 6 inches thick; clear lower boundary.

B_{21} 5 to 9 inches, brown (7.5YR 5/4) to dark-brown (7.5YR 4/4) sandy loam to fine sandy loam; essentially structureless but a very weak tendency toward fine subangular blocky or fine crumb structure; very friable; rapidly permeable to water; pH 5.8 to 6.0; 3 to 5 inches thick; clear lower boundary.

B_{22} 9 to 15 inches, yellowish-brown (10YR 5/6) fine sandy loam; very weak subangular blocky but breaks to very weak fine crumb structure or single grain; very friable; very rapidly permeable to water; pH 5.8 to 6.2; 5 to 7 inches thick; gradual lower boundary.

B_{3g} 15 to 36 inches, brown (10YR 5/3) fine to very fine sandy loam; common distinct mottles of strong brown (7.5YR 5/8); very weak fine crumb structure or single grain; rapidly permeable to water; pH 6.0 to 6.5; 18 to 24 inches thick; gradual lower boundary.

C 36 to 44 inches+, dark grayish-brown (10YR 4/2) fine sandy loam to loamy fine sand; a few coarse distinct mottles of strong brown (7.5YR 5/8); very weak to fine crumb structure or single grain; slightly alkaline to calcareous; rapidly permeable to water; low water-holding capacity; dense layers of fine sand and silt at depths greater than 50 or 60 inches.

Range in characteristics: The texture of the surface layer ranges from medium sandy loam to very fine sandy loam. In places the sands from which the soil has formed were derived mainly from shale, and in other places the sands were derived both from shale and limestone. Mapped with this soil are some areas that are moderately well drained to somewhat poorly drained.

Relief: Nearly level to gently sloping.

Drainage: Moderately good. Surface runoff is slow. Internal drainage is medium but is somewhat restricted by dense layers of fine sand or silt that occur below the C horizon.

Native vegetation: Hard maple, beech, black cherry, ash, and elm.

MAPPING UNIT

The following is the only member of the Galen series mapped in Lewis County:

Galen fine sandy loam, 0 to 6 percent slopes (GcB; Group 8).

Genesee Series

The soils of the Genesee series are well drained. They have formed in alluvium washed from soils formed from glacial drift. The drift was derived mainly from mildly calcareous shale and limestone.

These soils are in the same catena as the moderately well drained to somewhat poorly drained Eel soils, the poorly drained to somewhat poorly drained Wayland soils, and the very poorly drained Sloan soils. They are the dominant alluvial soils occurring along the streams that flow across the high-lime section of the county between the Tug Hill Plateau and the Black River. The soils of the Genesee series are in the Alluvial great soil group.

Typical profile (Genesee silt loam—cultivated):

A_p 0 to 10 inches, very dark grayish-brown (10YR 3/2) silt loam; friable; strong medium to coarse granular structure; peds firm when moist and nonsticky when wet; pH 6.8 to 7.0; gradual lower boundary.

C_1 10 to 30 inches, dark grayish-brown (10YR 4/2) silt loam; friable; some organic matter; slightly firm in place; breaks to lumps that have very weak subangular blocky structure; lumps break easily, and the structure is then medium crumb; pH 6.8 to 7.3; 18 to 24 inches thick; diffuse lower boundary.

C_2 30 inches+, dark-brown (10YR 4/3) to very dark grayish-brown (10YR 3/2) fine sandy loam; firm in place; friable when removed; weak fine to medium crumb structure; some stratified layers of fine sandy loam and medium sand; pH 7.0 to 7.5.

Range in characteristics: Marked variations in texture occur throughout the soil and within short distances. In many places layers and lenses of coarse sand or gravel are at depths below 24 inches. Some areas that are adjacent to the alluvial fans are shaly. These have a very dark color.

Relief: Nearly level on first bottoms to very gently sloping on fans.

Drainage: Good. Soils are subject to periodic flooding but usually remain flooded for only short periods. Internal drainage is medium.

Native vegetation: Elm, hard and soft maple, black cherry, white ash, and willow.

MAPPING UNITS

The following mapping units are in the Genesee series:

Genesee silt loam, 0 to 2 percent slopes (GdA; Group 11).

Genesee silt loam, alluvial fans, 0 to 3 percent slopes (GeA; Group 11).—This soil is made up mainly of dark-colored Utica shale. It occurs on alluvial fans. The areas are gently sloping. They are flooded less often than areas of the typical soil.

Glenfield Series

The soils of the Glenfield series are poorly drained. They have formed from materials washed from alluvial fans or deposited along the margins of lakes. These materials are made up mainly of dark-colored shales that may be weakly calcareous, or alkaline, or acid in reaction.

These soils are in the same catena as the well drained Herkimer soils, the somewhat poorly drained to moderately well drained Houseville soils, and the very poorly drained Westland soils. They are the Hydromorphic associates of the other soils in the catena and are in the Low-Humic Gley great soil group.

Typical profile (Glenfield silt loam—cultivated):

A_p 0 to 10 inches, very dark gray (5Y 3/1) silt loam; moderate medium to coarse crumb or granular structure; friable when moist and somewhat sticky and plastic when wet; pH 6.4 to 7.0; 8 to 12 inches thick; clear lower boundary.

B_{1g} 10 to 14 inches, olive-gray (5Y 5/2) silt loam faintly mottled with yellowish brown; weak coarse blocky structure but breaks to medium crumb; slightly plastic

when wet; pH 6.7 to 7.2; 3 to 5 inches thick; clear to gradual lower boundary.

B_{21g} 14 to 18 inches, dark-gray (5Y 4/1) and light yellowish-brown (2.5Y 6/4) heavy silt loam; prominently mottled; weak medium to coarse blocky structure; plastic when wet; pH 6.8 to 7.2; 3 to 5 inches thick; gradual lower boundary.

B_{22g} 18 to 28 inches, dark-gray (10YR 4/1) silty clay loam; distinct to prominent mottles of light yellowish brown (2.5Y 6/4); weak coarse blocky structure; plastic when wet; pH 7.0 to 7.3; 8 to 12 inches thick; diffuse lower boundary.

C 28 inches+, mixed dark fragments of shale with some gravel and sand; weakly stratified in a matrix of silt; weak coarse blocky structure in the upper part; grades to loose, water-logged sand and fragments of shale with little silt or clay at depths below 3 or 4 feet; rests on calcareous glacial till or limestone bedrock at depths between 3 and 6 feet; alkaline to calcareous.

Range in characteristics: Both neutral and acid phases are mapped in this series. The profiles are similar throughout the range of the series. The colors vary, however, and in places the soil is lighter colored than elsewhere because it has been less influenced by dark-colored shale. In many places the deposits from which the soil has formed consist of fine-textured materials washed from the marginal areas of shallow lakes.

Relief: Nearly level to very gently sloping; in places, slightly depressed.

Drainage: Poor. Surface runoff is slow and internal drainage is very slow.

Native vegetation: Whitecedar, elm, willow, and soft maple.

MAPPING UNITS

The following mapping units are in the Glenfield series:

Glenfield silt loam, neutral, 0 to 5 percent slopes (GfA; Group 30).

Glenfield silt loam, acid, 0 to 3 percent slopes (GgA; Group 30).—Except that this soil is strongly acid throughout, it is similar to the typical soil described for the series. It occurs near the acid phases of the Herkimer and Houseville series.

Gloucester Series

The soils of the Gloucester series are well drained and deep. They have formed on loose, very stony glacial till of Late Wisconsin age. The till was derived mainly from gneiss but partly from granite and syenite. The soils occur on uplands on the east side of the Black River, between the river and the sand plain.

These soils are in the same catena as the moderately well drained to somewhat poorly drained Scituate soils, the poorly drained to somewhat poorly drained Ridgebury soils, and the very poorly drained Whitman soils, and they occur in association with these soils. They are also associated with the Essex soils that have formed from the same kind of material but that have a strongly expressed fragipan. Their C horizon is not so hard as that of the Essex soils. The Gloucester soils are weak Podzols.

Typical profile (Gloucester stony fine sandy loam—virgin):

A_0 2 to 0 inches, rootbound mor; crumblike and not greasy; pH 5.0 to 5.2; 1 to 3 inches thick; abrupt lower boundary.

A_1 0 to 4 inches, very dark gray (10YR 3/1) stony loam or fine sandy loam; strong fine crumb structure; fluffy when dry and nonsticky when wet; pH 5.0 to 5.2; 3 to 5 inches thick; clear lower boundary.

B_{21} 4 to 10 inches, strong-brown (7.5YR 5/8) gritty stony loam; very weak medium subangular blocky structure but breaks readily, and the structure then is thin weak fine crumb; very friable; rapidly permeable; pH 5.2 to 5.4; 5 to 8 inches thick; gradual lower boundary.

B_{22} 10 to 16 inches, strong-brown (7.5YR 5/6) stony loam or fine sandy loam; same structure as the horizon immediately above; rapidly permeable; pH 5.0 to 5.4; 5 to 8 inches thick; gradual lower boundary.

B_3 16 to 24 inches, yellowish-brown (10YR 5/6) stony loam or fine sandy loam; very weak very fine crumb structure; very friable; contains much coarse sand, small angular stones, and boulders; rapidly permeable; low water-holding capacity; pH 5.4 to 5.5; 6 to 10 inches thick; gradual lower boundary.

C 24 inches+, brown (10YR 5/3) coarse sandy and bouldery till; weak medium platy structure but single grain if crushed; slightly firm in place but friable when removed; rapidly permeable; medium to low water-holding capacity; pH 5.4 to 5.6.

Range in characteristics: The texture of the surface soil ranges from loam to sandy loam. The soil is stony or very stony. All of the cultivated areas have had large amounts of stone removed. In most places there are half-buried boulders and rock outcrops. Included with this soil are some areas in which there is a weak fragipan.

Relief: Gently rolling to steep; dominant slopes in areas suitable for agriculture are 5 to 15 percent.

Drainage: Good. Surface runoff is medium to very rapid, and internal drainage is medium to rapid.

Native vegetation: Hard maple, beech, black cherry, basswood, ash, and some white pine and hemlock.

MAPPING UNITS

The following mapping units are in the Gloucester series:

Gloucester stony fine sandy loam, 3 to 8 percent slopes (GkB; Group 5).

Gloucester stony fine sandy loam, 8 to 15 percent slopes (GkC; Group 16).

Gloucester stony sandy loam, 3 to 8 percent slopes (GmB; Group 5).—This soil is generally coarser throughout and has a looser and more open substratum than the typical soil described for the series. It also has a lower water-holding capacity, but there is little difference between the two types in their suitability for agriculture.

Gloucester stony sandy loam, 8 to 15 percent slopes (GmC; Group 24).

Gloucester stony sandy loam, 15 to 25 percent slopes (GmD; Group 28).

Gloucester and Essex very stony fine sandy loams, 3 to 15 percent slopes (GoC; Group 38).—This undifferentiated soil group is made up of soils from both the Gloucester and Essex series. The areas are marked by large amounts of stones, boulders, and rock outcrops. Even if cleared, they are suitable only for pasture.

Gloucester and Essex very stony fine sandy loams, 15 to 35 percent slopes (GoD; Group 41).

Gloucester and Scituate soils, extremely stony, 3 to 35 percent slopes (GpD; Group 41).—This undifferentiated soil group is made up of extremely stony areas of Gloucester and Scituate soils. The areas are too steep and stony for agriculture.

Gloucester very stony fine sandy loam, shallow, 5 to 25 percent slopes (GnD; Group 41).—This soil occupies areas where gneiss bedrock is exposed or is at depths of less than 2 feet. It occurs near the undifferentiated soil groups of Gloucester and Essex soils. The soil is not suited to agriculture, but some of it is used for permanent pasture.

Gloucester fine sandy loam, neutral substratum, 3 to 8 percent slopes (GhB; Group 5).—This soil is formed from glacial till that overlies limestone bedrock. The till has enough lime in it so that the substratum and the lower part of the subsoil have a pH of 6.5 or 7.0. Except that this soil has a neutral reaction and, therefore, is more productive, it is similar to the typical soil described for the series. It occurs west of the Black River and north of the Deer River.

Gloucester fine sandy loam, neutral substratum, 8 to 15 percent slopes (GhC; Group 16).

Granby Series

The soils of the Granby series are very poorly drained to poorly drained. They have developed on alkaline or calcareous sandy material and occupy flat or depressed areas.

These soils are in the same catena as the well drained Petoskey soils, the moderately well drained Galen soils, and the somewhat poorly drained to poorly drained Junius soils. They belong to the Humic Gley great soil group.

Typical profile (Granby fine sandy loam—undisturbed):

A_0 2 to 0 inches, black, well-decomposed forest litter; pH 6.3 to 6.6; 2 to 4 inches thick; clear lower boundary.

A_1 0 to 8 inches, very dark gray (10YR 3/1) mucky fine sandy loam; weak fine crumb structure; some pebbles, gravel, and small stones occur in places; pH 6.5 to 7.0; 6 to 10 inches thick; abrupt lower boundary.

$B_{21}G$ 8 to 18 inches, gray (10YR 6/1) to light brownish-gray (10YR 6/2) sandy loam or fine sandy loam; common coarse mottles of yellowish brown (10YR 5/6); single grain; slightly firm in place but loose when crushed; pH 6.5 to 7.0; 8 to 12 inches thick; clear lower boundary.

$B_{22}G$ 18 to 28 inches, gray (10YR 5/1) to grayish-brown (10YR 5/2) fine sand; a few medium mottles of light yellowish brown (10YR 6/4); single grain; slightly firm in place; pH 6.5 to 7.0; 8 to 12 inches thick; gradual lower boundary.

C 28 inches+, grayish-brown (2.5Y 5/2) firm fine or medium sand derived from shale, limestone, and igneous rocks; contains some gravel and stones: alkaline to calcareous.

Range in characteristics: The surface horizon varies in thickness and in content of organic matter. It is mainly made up of mineral material that is high in organic matter, but in some places a shallow layer of peat or muck overlies the mineral soil. In some places there is much gravel and many stones of small size.

Relief: Nearly level, flat, or slightly depressed.

Drainage: Very poor. Surface runoff is very slow, and, because of a high natural water table, there is very little internal drainage.

Native vegetation: Whitecedar, elm, and hemlock.

MAPPING UNIT

The following is the only member of the Granby series mapped in Lewis County:

Granby fine sandy loam, 0 to 2 percent slopes (GrA; Group 22).

Groveton Series

The soils of the Groveton series are well drained and have developed from fine sands derived mainly from granite. They occur on low stream terraces or high bottoms.

The only soil of this series mapped in the county, Groveton fine sandy loam, 0 to 3 percent slopes, is the only member of its catena. It occurs in association with the Ondawa, Podunk, and Rumney soils that are on adjacent first bottoms and with the Adams and Colton soils that occur at higher levels. The Groveton soils are Podzols.

Typical profile (Groveton fine sandy loam—cultivated):

A_p 0 to 9 inches, very dark grayish-brown (10YR 3/2) sandy loam to fine sandy loam; weak medium crumb structure; friable; pH 5.3 to 5.5; 6 to 10 inches thick; abrupt lower boundary.

B_{21} 9 to 16 inches, strong-brown (7.5YR 5/6 to 5/8) sandy loam; moderate medium crumb structure; slightly firm in place but friable when crushed; has some pebble-sized iron concretions in places; pH 5.2 to 5.5; 6 to 8 inches thick; clear lower boundary.

B_{22} 16 to 36 inches, yellowish-brown (10YR 5/6) loose, open medium sand; single grain; has a few small iron concretions in places; pH 5.2 to 5.5; 18 to 24 inches thick; diffuse lower boundary.

C 36 inches+, brown (10YR 5/3) loose, medium sand; has a few stains of strong brown (7.5YR 5/8); derived mainly from quartz but partly from feldspar; continuous to depths of 6 to 8 feet or more; permanent water table at a depth of 4 feet; pH 5.2 to 5.5.

Range in characteristics: The texture of the surface layer ranges from fine sandy loam to medium sand. In places gravel is on the surface, and in some places it occurs at depths of 24 to 30 inches. Included with this soil in mapping are some areas that are moderately well drained.

Relief: Level.

Drainage: Good. Surface runoff is slow and internal drainage is rapid.

Native vegetation: White pine, hemlock, and gray birch with some beech and hard maple.

MAPPING UNIT

The following is the only member of the Groveton series mapped in Lewis County:

Groveton fine sandy loam, 0 to 3 percent slopes (GsA; Group 2).

Hartland Series

The soils of the Hartland series are well drained. They have developed in lake-laid very fine sands and silts that were derived from gneiss and granitic rocks of the Adirondacks. They occupy rolling or hilly areas.

These soils are in the same catena as the moderately well drained Buxton soils and occur in association with those soils. They are also associated with Adams and Colton soils and with soils of the Suffield catena. The soils of the Hartland series are weak Podzols.

Typical profile (Hartland very fine sandy loam—virgin):

A_0 2 to 0 inches, dark-brown to black organic mor humus layer; matted with fine roots; pH 5.0 to 5.2; 1 to 3 inches thick; abrupt lower boundary.

A_1 0 to 2 inches, dark-gray (10YR 4/1) very fine sandy loam consisting of mixed organic and mineral materials matted with fine roots; strong fine crumb structure; very friable; pH 5.0 to 5.2; 1 to 4 inches thick; clear lower boundary.

B_{21} 2 to 5 inches, dark-brown (7.5YR 4/2) very fine sandy loam; slightly firm in place; moderate fine crumb structure; friable; pH 5.0 to 5.2; 2 to 5 inches thick; clear lower boundary.

B_{22} 5 to 11 inches, yellowish-brown (10YR 5/6) very fine sandy loam; weak medium crumb structure; very friable; pH 5.2 to 5.4; 5 to 9 inches thick; gradual lower boundary.

B_3 11 to 17 inches, brown (10YR 5/3) very fine sandy loam; weak fine crumb structure; loose; pH 5.6 to 5.8; 4 to 8 inches thick; abrupt lower boundary.

D_1 17 to 34 inches, light yellowish-brown (10YR 6/4) coarse silt loam to very fine sand; weak medium platy structure; slightly firm in place but friable when crushed; pH 5.6 to 5.8; 14 to 20 inches thick; gradual lower boundary.

D_2 34 to 50 inches, grayish-brown (10YR 5/2) to light brownish-gray (10YR 6/2) silt; massive; firm in place; laminated; pH 6.0 to 6.5.

Range in characteristics: The depth of the soil over gray silt ranges from 2 to 4 feet. The texture throughout

is mostly very fine sandy loam, but in places coarse silt occurs. In some places the substratum consists of laminated silt and very fine sand.

Relief: Strongly to gently rolling and in places resembles kames.

Drainage: Good. Surface runoff is rapid and internal drainage is medium.

Native vegetation: Beech, hard maple, black cherry, ironwood, and some hemlock and white pine.

MAPPING UNITS

The following mapping units are in the Hartland series:

Hartland very fine sandy loam, 2 to 6 percent slopes (HaB; Group 6).

Hartland very fine sandy loam, 6 to 12 percent slopes (HaC; Group 17).

Hartland very fine sandy loam, 12 to 20 percent slopes (HaD; Group 29).

Herkimer Series

The soils of the Herkimer series are well drained. They have formed on alluvial fans or on outwash deposits of dark-colored shale. The parent materials are gray, acid shale; thin-bedded sandstone; and black, mildly calcareous shale. The fans on which the soils occur were built up at the base of the Tug Hill Plateau by streams that cut through the face of the escarpment. The soils occur in a continuous belt from the town of Harrisburg to the town of Leyden.

Both neutral and acid phases of Herkimer soils are mapped in this county. The nearly neutral or alkaline soils have formed mainly from black shale. The strongly acid soils have formed mainly from sandstone and gray, acid shale; they are lighter in color then the less acid soils. The Herkimer soils are in the same catena as the somewhat poorly drained to moderately well drained Houseville soils, the poorly drained Glenfield soils, and the very poorly drained Westland soils. They are not so clayey as the other soils of the catena. The Herkimer series is made up of young, weakly developed Gray-Brown Podzolic soils.

Typical profile (Herkimer silt loam—cultivated):

A_p 0 to 6 inches, dark grayish-brown (10YR 4/2) shaly silt loam; weak fine to medium crumb structure; friable; pH 6.1 to 6.5; 5 to 8 inches thick; clear lower boundary.

A_2 6 to 10 inches, brown (10YR 5/3) shaly silt loam; structureless where there is a high proportion of shale fragments to weak medium subangular blocky where the shale has broken down; very friable; pH 6.1 to 6.5; 4 to 6 inches thick; clear lower boundary.

B_2 10 to 24 inches, very dark grayish-brown (10YR 3/2) silt loam; somewhat firm in place; weak medium subangular blocky structure; friable; shaly, but the fines have more clay than in the horizon immediately above; pH 6.3 to 7.0; 12 to 18 inches thick; gradual lower boundary.

C 24 inches+, very dark grayish-brown (10YR 3/2) mixed fragments of shale the size of sand and gravel; some limestone pebbles at depths below 3 feet; loose or friable; rapidly permeable; pH 6.5 to 7.0+.

Range in characteristics: In places the soil is a mass of soft, partly decomposed shale fragments and shows little profile development. In others the shale is completely decomposed. Where the shale is decomposed, the soil is silty and there are differences in color and texture in the profile. In places, both kinds of soils occur close to each other. The amount of limestone gravel in the substratum varies. It ranges from none in areas close to the base of the Tug Hill escarpment to large amounts where the soil occurs farther from the base. Typically, the soil is neutral to slightly acid, but the acid phases are strongly acid.

Relief: Nearly level to gently sloping, with some strongly rolling, kamelike areas.

Drainage: Good. Surface runoff and internal drainage are medium to rapid.

Native vegetation: Hard maple, beech, ash, hickory, basswood, and elm; whitecedar has encroached in the permanent pastures.

MAPPING UNITS

The following mapping units are in the Herkimer series:

Herkimer silt loam, neutral, 0 to 3 percent slopes (HbA; Group 1).

Herkimer silt loam, neutral, 3 to 8 percent slopes (HbB; Group 3).

Herkimer silt loam, neutral, 8 to 15 percent slopes (HbC; Group 14).

Herkimer silt loam, acid, 0 to 3 percent slopes (HcA; Group 1).—Except that this soil is strongly acid, somewhat lighter in color, and contains some fragments of thin sandstone, it is similar to the typical soil described for the series. The parent material was derived from shale of the Lorraine formation, which overlies dark-colored, mildly calcareous Utica shale. Except that this soil needs more lime, it is used the same as the neutral Herkimer soils.

Herkimer silt loam, acid, 3 to 8 percent slopes (HcB; Group 3).

Herkimer silt loam, acid, 8 to 15 percent slopes (HcC; Group 14).

Herkimer silt loam, 15 to 25 percent slopes (HbD; Group 26).—This soil is made up of both neutral and acid phases of Herkimer silt loam that occur on moderately steep slopes. Except that the soil is thinner and contains a more variable amount of shale fragments and gravel, it is similar to the profile described for the series. This soil is used mainly for permanent pasture.

Hermon Series

The soils of the Hermon series are deep and well drained. They have developed on loose glacial till of Late Wisconsin age. The till was derived mainly from gneiss, granite, and syenite.

The soils of the Hermon series were not mapped in detail. In the reconnaissance mapping of the forested eastern part of the county, they were included in several soil associations. These associations are described in the section, Soil Associations.

The Hermon soils are in the same catena as the moderately well drained to somewhat poorly drained Waumbek soils, the poorly drained to somewhat poorly drained Ridgebury soils, and the very poorly drained Whitman soils. They are associated with the other soils of the catena and are also associated with the Becket soils that have formed from similar parent material but that have a strongly expressed fragipan. The Hermon soils are Podzols.

Typical profile (Hermon stony loamy sand—forested):

A_0 2 to 0 inches, deciduous forest litter over a black mor humus layer; matted with roots; pH 4.0 to 4.5; 1 to 3 inches thick; abrupt lower boundary.

A_2 0 to 3 inches, pinkish-gray (7.5YR 6/2) stony loamy fine sand to stony loamy sand; friable; single grain; pH 4.0 to 4.5; 2 to 4 inches thick; abrupt lower boundary.

B_{2h} 3 to 5 inches, dark reddish-brown (5YR 2/2) stony loamy sand; weak fine crumb structure; friable; some small, dark-red concretions the size of pebbles; pH 4.0 to 4.2; 2 to 4 inches thick; clear lower boundary.

B_{22} 5 to 12 inches, strong-brown (7.5YR 5/8) stony loamy fine sand or loamy sand; very weak fine crumb structure; friable; pH 4.3 to 4.6; 7 to 10 inches thick; gradual lower boundary.

B_3 12 to 24 inches, yellowish-brown (10YR 5/4) stony loamy sand; slightly firm in place; weak, crude, thick platy structure; very weak fine crumb structure or single

grain when removed; pH 4.5 to 4.7; 10 to 16 inches thick; gradual lower boundary.

C 24 inches+, grayish-brown (10YR 5/2) stony glacial till that has loamy coarse sand to loamy sand texture; slightly firm in place, and single grain when removed; pH 4.8 to 5.2.

Range in characteristics: The texture of the surface layer ranges from loam to loamy sand, and the soils are stony to extremely stony. The solum is 2 to 3 feet thick. In places in the B_{22} horizon, discontinuous cementing occurs. Little of the soil has been used for crops. In areas that have been cultivated, however, the soil in the upper horizons has been mixed by plowing and these horizons are brown or yellowish brown.

Relief: Gently rolling to steep.

Drainage: Good. Surface runoff is medium to rapid, and internal drainage is rapid.

Native vegetation: Northern hardwoods, mainly beech and hard maple with yellow birch, black cherry, and basswood; some white pine and hemlock.

Hinckley Series

The soils of the Hinckley series are well drained to excessively drained. They have formed on glaciofluvial materials derived mainly from gneiss and granite but containing some crystalline limestone. In Lewis County the parent material contains enough limestone to make the soils neutral or slightly alkaline. The soils have been mapped as neutral substratum phases.

These soils are associated with Bonaparte soils, but they contain less calcite than the Bonaparte soils. They are weak Podzols, but in most places they are transitional between the Bonaparte soils, which belong to the Brown Forest great soil group, and the Colton soils, which are strong Podzols.

Typical profile (Hinckley sandy loam, neutral substratum—virgin):

A_0 2 to 0 inches, forest floor, made up of a very dark gray to black root mor; pH 5.5 to 6.0; 1 to 3 inches thick; abrupt lower boundary.

A_1 0 to 3 inches, dark grayish-brown (10YR 4/2) coarse sandy loam and some fine gravel; weak very fine crumb structure; very friable; pH 5.0 to 5.4; 2 to 4 inches thick; clear lower boundary.

B_{21} 3 to 8 inches, strong-brown (7.5YR 5/6) coarse sandy loam and fine gravel; very friable; very weak fine crumb structure; pH 5.0 to 5.4; 4 to 6 inches thick; clear lower boundary.

B_{22} 8 to 14 inches, yellowish-brown (10YR 5/4 to 4/6) loamy coarse sand; contains more fine gravel and pebbles than the horizon immediately above; very weak fine crumb structure; very friable to loose; pH 5.2 to 5.4; 5 to 7 inches thick; gradual lower boundary.

B_{23} 14 to 28 inches, yellowish-brown (10YR 5/8) gravelly coarse sand; contains up to 50 percent small pebbles; single grain; loose; pH 5.5 to 6.0; 12 to 18 inches thick; diffuse lower boundary.

C_1 28 to 36 inches, light yellowish-brown (10YR 6/4) gravelly coarse sand; single grain; loose; pH 6.4 to 6.6; 8 to 12 inches thick; diffuse lower boundary.

C_2 36 inches+, light yellowish-brown to pale-brown (10YR 6/3 to 6/4) very coarse sand; contains less than 10 percent gravel; single grain; loose; very rapidly permeable; pH 6.6 to 7.2; in places, at depths below 5 to 7 feet, limestone fragments and calcite crystals occur.

Range in characteristics: Where the soil in the upper horizons has been mixed by plowing, the surface layer is grayish-brown coarse sandy loam and is 8 inches thick. The amount of gravel and cobbles in the soil varies. Typically, both the solum and substratum contain less than 25 percent by volume. The parent material contains varying amounts of calcareous material made up mainly of calcite crystals. The amount of calcareous materials ranges from abundant, where the soil is adjacent to Bonaparte soils, to very little, where it is associated with Colton soils.

Relief: Nearly level to steep.

Drainage: Good to excessive. Surface runoff is slow, and internal drainage is rapid to very rapid.

Native vegetation: Hard maple, beech, black cherry, white ash, and, in abandoned fields, gray birch, pin cherry, and whitecedar.

MAPPING UNITS

The following mapping units are in the Hinckley series:

Hinckley sandy loam, neutral substratum, 0 to 3 percent slopes (HdA; Group 23).

Hinckley sandy loam, neutral substratum, 3 to 8 percent slopes (HdB; Group 23).

Hinckley sandy loam, neutral substratum, 8 to 15 percent slopes (HdC; Group 24).

Houseville Series

The soils of the Houseville series are somewhat poorly drained to moderately well drained. They have formed from clayey deposits and occur on alluvial fans. Both neutral and acid phases have been mapped. The neutral phases have formed from black Utica shale that is mildly calcareous or neutral. The parent material of the acid phases was derived from gray, acid Lorraine shale that overlies black, calcareous shale.

These soils are in the same catena as the well-drained Herkimer soils, the poorly drained Glenfield soils, and the very poorly drained Westland soils. Except for the Westland soils, they all have acid phases in which the soil, except for being strongly acid, is similar to that described in the typical profile. The Houseville soils are finer textured than the Herkimer soils. They are in the Gray-Brown Podzolic great soil group.

Typical profile (Houseville silt loam—cultivated):

A_p 0 to 8 inches, dark-brown (7.5YR 3/2) to very dark grayish-brown (10YR 3/2) silt loam; strong medium granular or crumb structure; friable when moist and somewhat sticky and plastic when wet; pH 6.0 to 6.5; 7 to 10 inches thick; clear lower boundary.

A_2 8 to 16 inches, dark grayish-brown (10YR 4/2) silt loam; common, coarse, distinct mottles of yellowish brown (10YR 5/4); moderate medium crumb structure; friable; pH 5.5 to 6.0; 6 to 10 inches thick; gradual lower boundary.

B_{21} 16 to 20 inches, dark grayish-brown (10YR 4/2) heavy silt loam prominently mottled with yellowish brown (10YR 5/4); weak medium subangular blocky structure; sticky and plastic when wet; pH 6.8 to 7.2; 4 to 6 inches thick; gradual lower boundary.

B_{22} 20 to 34 inches, dark grayish-brown (10YR 4/2) silty clay loam, prominently mottled with yellowish brown (10YR 5/4); weak coarse blocky structure; sticky and plastic when wet; pH 6.8 to 7.2; 12 to 18 inches thick; diffuse lower boundary.

C 34 to 40 inches+, very dark grayish-brown (10YR 3/2) loose shaly silt loam that grades to water-sorted shale fragments, fine sand, and some silt; commonly calcareous but only mildly alkaline; pH 7.5.

Range in characteristics: In some places the soil is much lighter in color throughout than the soil described for the series, and in these places it is generally somewhat better drained. Although the pH of the solum is typically above 6.0, in places it is as low as 5.5. In the

substratum of the neutral phases, the pH is 6.0 or above. In the acid phases, which were formed from materials derived from lighter colored shale, the soil is lighter in color than the typical soils. In the substratum of the acid soils, the pH is below 6.0. Except that the acid phases require more lime, the neutral and acid phases are used and managed the same way.

Relief: Nearly level to gently sloping.

Drainage: Somewhat poor to moderate. Surface runoff is slow, and the internal drainage is slow to very slow. Because of the mild relief and the limestone bedrock underlying the soil, there is a high natural water table.

Native vegetation: Northern hardwoods, hemlock, elm, and whitecedar.

MAPPING UNITS

The following mapping units are in the Houseville series:

Houseville silt loam, neutral, 0 to 3 percent slopes (HeA; Group 13).

Houseville silt loam, neutral, 3 to 8 percent slopes (HeB; Group 7).

Houseville silt loam, acid, 0 to 3 percent slopes (HfA; Group 13).—This soil is similar to the typical soil. It is lighter colored, however, and has a pH below 6.0 throughout the profile and parent material.

Houseville silt loam, acid, 3 to 10 percent slopes (HfB; Group 7).

Howard Series

The soils of the Howard series are well drained. They have formed on glacial outwash and deltaic materials consisting of stratified sand and gravel derived from black and gray shales and limestone. In this county the Howard soils are darker colored than elsewhere and have developed from more shaly and darker colored material than is typical of the soils of this series. They occur in the vicinity of Constableville and Turin.

These soils are in the same catena as the very poorly drained Westland soils. In many places they are associated with Glenfield and Houseville soils. The Howard soils are Gray-Brown Podzolic-weak Podzol intergrades.

Typical profile (Howard loam—cultivated):

A_p 0 to 7 inches, dark grayish-brown (10YR 4/2) loam; moderate medium to fine crumb structure; friable; pH 5.5 to 6.0; 6 to 8 inches thick; abrupt lower boundary.

A_{21} 7 to 13 inches, yellowish-brown (10YR 5/4) loam to light silt loam; weak fine to medium crumb structure; friable; pH 5.5 to 5.7; 5 to 7 inches thick; clear lower boundary.

A_{22} 13 to 18 inches, dark-brown (10YR 4/3) gravelly loam; weak fine blocky structure; friable; pH 5.4 to 5.6; 3 to 6 inches thick; clear lower boundary.

B_{21} 18 to 22 inches, dark-brown (10YR 4/3) gravelly sandy clay loam; weak medium to fine blocky structure; friable; many clayflow surfaces on peds and clay bridges between sand grains; pH 5.4 to 6.0; 4 to 6 inches thick; gradual lower boundary.

B_{22} 22 to 34 inches, dark grayish-brown (10YR 4/2) gravelly sandy clay loam; moderate medium blocky structure; friable; pH 5.4 to 5.6; 10 to 14 inches thick; gradual lower boundary.

B_3 34 to 46 inches, dark-brown (7.5YR 4/2) gravelly sandy clay loam; weak medium blocky structure; contains weathered, dark-brown shale and sandstone gravel; pH 6.0 to 6.5; 12 to 18 inches thick; gradual lower boundary.

C 46 inches+, dark grayish-brown (10YR 4/2) mixed sand and gravel derived from shale, sandstone, and limestone; loose and open textured; rapidly permeable; calcareous.

Range in characteristics: In places there is an intermittent B horizon made up of alternating 2- to 4-inch bands of dark grayish-brown gravelly sandy loam and 1- to 2-inch bands of gravelly sandy clay loam. The gravelly sandy clay loam has many clayflow surfaces on the peds and a weak fine blocky structure. In some places the parent material is a mixture of gravel and sand, and in others it is mainly sand but consists partly of fine gravel.

Relief: Nearly level to strongly rolling or hilly.

Drainage: Good. Surface runoff and internal drainage are medium to rapid.

Native vegetation: Hard maple, beech, black cherry, basswood, and hickory.

MAPPING UNITS

The following mapping units are in the Howard series:

Howard loam, 0 to 3 percent slopes (HgA; Group 1).

Howard loam, 3 to 8 percent slopes (HgB; Group 3).

Howard loam, 8 to 15 percent slopes (HgC; Group 14).

Howard and Kars soils, 15 to 35 percent slopes (HhD; Group 26).—This mapping unit is made up of steep Howard and Kars soils. The Kars soils are described elsewhere in the report.

Hudson Series

The soils of the Hudson series are well drained. They have formed on silty glaciolacustrine deposits that are weakly calcareous. The deposits were derived mainly from shale and limestone. The soils occur west of the Black River, between the river and the first and second limestone escarpments in the towns of Martinsburg and Turin.

These soils are in the same catena as the somewhat poorly drained to moderately well drained Rhinebeck soils and the poorly drained to very poorly drained Madalin soils. They are associated with other members of the catena and with the Nellis and Petoskey soils. The Hudson soils belong to the Gray-Brown Podzolic great soil group.

Typical profile (Hudson silt loam—cultivated):

A_p 0 to 8 inches, brown (10YR 5/3) light silt loam; moderate fine crumb structure; friable when moist and slightly sticky and plastic when wet; pH 6.0 to 6.5; 6 to 9 inches thick; clear lower boundary.

A_2 8 to 14 inches, yellowish-brown (10YR 5/6) silt loam; weak medium subangular blocky structure; peds break easily, and the structure is then fine crumb; friable; sticky and plastic when wet; pH 5.4 to 5.6; 5 to 7 inches thick; clear lower boundary.

B_{21} 14 to 18 inches, brown (10YR 5/3) silt loam; moderate medium blocky structure; slightly firm when moist and slightly sticky and plastic when wet; pH 5.6 to 5.8; 4 to 6 inches thick; gradual lower boundary.

B_{22} 18 to 36 inches, dark-brown (10YR 4/3) silt loam; strong medium blocky structure; firm when moist and sticky and plastic when wet; pH 5.8 to 6.2; 16 to 20 inches thick; gradual lower boundary.

C_1 36 to 44 inches, brown (7.5YR 5/4) silt loam; weak medium blocky structure; some lamination; friable when moist and firm when dry; pH 6.5 to 6.7; 7 to 10 inches thick; gradual lower boundary.

C_2 44 inches+, brown (10YR 5/3) to yellowish-brown (10YR 5/4) silt; laminated; firm when moist, very firm when dry, and sticky and plastic when wet; pH 7.5 to calcareous.

Range in characteristics: The texture of the surface layer ranges from fine sandy loam through very fine sandy loam to heavy silt loam. The subsoil is faintly mottled in places, particularly where the texture is heavy silt loam. The depth to calcareous material ranges from 2½ to 4 feet.

Drainage: Good. Surface runoff and internal drainage are medium.
Relief: Gently sloping to rolling.
Native vegetation: Hard maple, red maple, beech, black cherry, white ash, hickory, basswood, elm, and whitecedar.

MAPPING UNIT

The following mapping unit is the only member of the Hudson series mapped in this county. The profile described for the series was observed in an excavation made in this soil.

Hudson silt loam, 0 to 6 percent slopes (HkB; Group 6).

Ilion Series

The soils of the Ilion series are medium textured to moderately fine textured and are poorly drained to somewhat poorly drained. They have formed on calcareous till of Late Wisconsin age. The till was derived mainly from dark-colored shale and varying amounts of limestone, gneiss, and sandstone. The dark-colored shale gives the dark color and moderately fine texture to the soils.

These soils are in the same catena as the well drained Mohawk soils, the moderately well drained to somewhat poorly drained Manheim soils, and the very poorly drained Fonda soils, and they occur in association with those soils. They are also in the Poland-Turin-Ilion-Fonda catena. In places they are similar in color and reaction to the Marcy soils that have formed from similar parent material. In contrast to the Marcy soils, the Ilion soils have calcareous material at depths of less than 36 inches and do not have a fragipan. The Ilion soils are finer textured and darker colored than the Kendaia soils that have also formed on glacial till. Ilion soils belong to the Low-Humic Gley great soil group.

Typical profile (Ilion silt loam—pastured):

A_{1p} 0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate medium crumb structure; friable; in places has prominent mottles of strong brown (7.5YR 5/8) along root channels in the lower 3 or 4 inches; pH 6.0 to 7.0; 7 to 10 inches thick; clear lower boundary.

A_2G 8 to 10 inches, grayish-brown (2.5Y 5/2 to 5/1) silt loam or heavy silt loam; moderate, fine, distinct, strong-brown (7.5YR 5/8) or yellowish-brown (10YR 5/8) mottles; very weak blocky to structureless; firm; this horizon is absent in many places or occurs only locally because of masking by organic matter; pH 6.0 to 7.0; 2 to 4 inches thick; clear lower boundary.

B_2G 10 to 24 inches, silty clay loam; moderate coarse to very coarse prismatic structure; prisms are coated with gray (2.5Y 5/1), dark gray (2.5Y 4/1), or dark grayish brown (2.5Y 4/2); secondary weak to medium fine blocky structure; interiors of peds are dark grayish brown (2.5Y 4/2) to dark olive brown (2.5Y 3/3) and have many, medium and fine, distinct mottles of yellowish brown or strong brown; slightly firm to firm when moist and moderately plastic when wet; pH 6.5 to 7.5; 12 to 16 inches thick; gradual lower boundary.

C 24 inches+, very dark gray (10YR 3/1) to very dark grayish-brown (10YR 3/2) silty clay loam or heavy silt loam; many to few, distinct and faint mottles in the upper part; weak to moderate medium and coarse blocks, crudely arranged in very thick plates, in many places; firm; calcareous; generally lime occurs between peds; contains many dark fragments of shale.

Range in characteristics: The color and texture of the B and C horizons vary according to the amount of shale in the soil material. The soils are lighter colored and silty where they occur in areas associated with Poland and Turin soils. Where they occur in areas associated with Mohawk and Manheim soils, they are darker colored and have a silty clay texture. In places, where the Ilion soils are transitional to the Marcy soils, carbonates occur at depths of less than 36 inches and the solum is thicker than in the typical soil.
Relief: Nearly level, or uniform to slightly concave, gently sloping areas.
Drainage: Poor. Surface runoff is slow, and internal drainage is slow to very slow.
Native vegetation: Soft maple, elm, hard maple, beech, hemlock, and whitecedar.

MAPPING UNITS

The following mapping units are in the Ilion series:

Ilion silt loam, 0 to 3 percent slopes (IaA; Group 30).
Ilion silt loam, 3 to 8 percent slopes (IaB; Group 19).

Junius Series

The soils of the Junius series are coarse textured and are somewhat poorly drained to poorly drained. They have developed in deltaic and glaciolacustrine deposits. These deposits consist of alkaline to weakly calcareous fine sand derived mainly from shale and limestone. The soils occur mainly between the Tug Hill Plateau and the Black River.

These soils are in the same catena as the well drained Petoskey soils, the moderately well drained Galen soils, and the very poorly drained to poorly drained Granby soils. They occur in association with the soils of the Nellis catena, which have developed in glacial till that is high in lime. The Junius soils belong to the Brown Forest great soil group.

Typical profile (Junius fine sandy loam—cultivated):

A_1 0 to 8 inches, very dark gray (5YR 3/1) fine sandy loam to very fine sandy loam; moderate medium to fine crumb structure; friable when moist and nonsticky when wet; pH 6.5 to 7.0; 6 to 9 inches thick; clear lower boundary.

A_2G 8 to 16 inches, light yellowish-brown (10YR 6/4) fine sandy loam; many distinct mottles of strong brown (7.5YR 5/8); weak fine crumb structure; friable when moist and nonsticky when wet; pH 6.6 to 7.0; 6 to 10 inches thick; gradual lower boundary.

B_2G 16 to 32 inches, fine sandy loam; many medium prominent mottles of yellowish red (5YR 5/8 to 4/8) and pale brown (10YR 6/3); weak blocky structure in place, but if peds are broken, the structure is very fine crumb or single grain; very friable; pH 6.5 to 7.0; 12 to 18 inches thick; gradual lower boundary.

C 32 inches+, brown (10YR 5/3) fine and very fine sand; laminated; slightly firm in place; single grain; mildly alkaline to calcareous.

Range in characteristics: The color of the surface soil ranges from very dark gray in flat and slightly depressed areas to gray on very gentle slopes. The texture of the solum ranges from fine sandy loam to very fine sandy loam. Included with this soil, however, are some areas of light silt loam too small to be mapped separately.
Relief: Level to slightly depressed and very gently sloping.
Drainage: Poor. Surface runoff is slow, and internal drainage is slow to very slow. Because limestone bedrock occurs at depths of 4 to 8 feet, there is a naturally high permanent water table.

Native vegetation: Elm, whitecedar, soft maple, and other water-tolerant deciduous trees.

MAPPING UNIT

The following mapping unit is the only member of the Junius series mapped in Lewis County:

Junius fine sandy loam, 0 to 3 percent slopes (JaA; Group 21).

Kars Series

The soils of the Kars series are well drained. They have formed on glaciofluvial and alluvial fan sediments derived mainly from limestone but partly from shale, sandstone, and granite.

The Kars series is the only member of its catena mapped in Lewis County. The soils are associated with the Petoskey soils that have formed on gravel-free sand also derived from shale, sandstone, and granite. They also occur in association with the soils of the Nellis catena that have formed on high-lime glacial till. The soils of the Kars series are in the Gray-Brown Podzolic great soil group.

Typical profile (Kars gravelly loam—cultivated):

A_p 0 to 8 inches, very dark brown (10YR 2/2) gravelly loam; moderate medium crumb structure; very friable; pH 7.0; 7 to 9 inches thick; clear lower boundary.

A_2 8 to 13 inches, pale-brown (10YR 6/3) gravelly loam or sandy loam; weak medium subangular blocky structure that breaks to fine crumb; very friable; pH 7.0; 4 to 6 inches thick; clear lower boundary.

B_{21} 13 to 17 inches, dark-brown (7.5YR 3/2) light gravelly sandy clay loam; moderate subangular blocky structure; slightly firm in place; friable; pH 7.5; 5 to 7 inches thick; gradual lower boundary.

B_{22} 17 to 22 inches, dark reddish-brown (5YR 3/2) gravelly sandy clay loam; moderate medium to coarse blocky structure, but peds break easily to medium crumb; slightly firm when moist; pH 7.0 to 7.5; 5 to 8 inches thick; clear irregular lower boundary.

B_3 22 to 28 inches, brown (7.5YR 5/4) to dark-brown (7.5YR 3/2) light sandy clay loam; much coarse sand and fine to coarse gravel; sand grains are coated and have bridges of clayflow; very weak coarse blocky structure; weakly calcareous; 5 to 8 inches thick; gradual lower boundary.

C 28 inches+, brown (10YR 5/3) mixed sand and gravel; contains much limestone and grades to beds of stratified sand and gravel; highly calcareous.

Range in characteristics: The texture of the surface horizon varies, and loam, fine sandy loam, and gravelly sandy loam types occur. The depth of the solum is normally about 24 inches, but in places tongues of material from the reddish-brown B horizon extend downward to as much as 4 feet. The deposits in the substratum range from coarse sand to cobbles. The parent material varies; in places it is mainly black shale, limestone, or a mixture of both.

Relief: Nearly level or gently sloping on alluvial fans and terraces, and steep or hilly on kames and delta fronts.

Drainage: Good to excessive. Surface runoff is medium to rapid, and internal drainage is rapid to very rapid.

Native vegetation: Hard maple, beech, basswood, and black cherry.

MAPPING UNITS

The following mapping units are in the Kars series:

Kars gravelly loam, 0 to 3 percent slopes (KaA; Group 1).
Kars gravelly loam, 3 to 8 percent slopes (KaB; Group 3).
Kars gravelly loam, 8 to 15 percent slopes (KaC; Group 14).

Kendaia Series

The soils of the Kendaia series are poorly drained to somewhat poorly drained. They have developed on highly calcareous glacial till made up of limestone and some shale, sandstone, and igneous erratics. The soils occur in depressions and swales along drainageways.

These soils are in the same catena as the well drained Nellis soils, the moderately well drained to somewhat poorly drained Amenia soils, and the very poorly drained Lyons soils. They are also in the Dover catena in which the soils have formed largely from crystalline limestone. Where the Kendaia soils occur in association with the Dover soils, they have a lighter color and a lighter texture. The Kendaia soils belong to the Low-Humic Gley great soil group.

Typical profile (Kendaia silt loam—undisturbed):

A_1 0 to 6 inches, black (10YR 2/1) to very dark grayish-brown (10YR 3/2) silt loam; moderate to strong medium crumb structure; has many fine roots and has been much worked over by worms; pH 6.8 to 7.0; 5 to 8 inches thick; abrupt lower boundary.

A_2G 6 to 9 inches, light yellowish-brown (10YR 6/4) silt loam; a few, coarse, distinct mottles of strong brown (7.5YR 5/8); thick medium platy to thin platy and fine crumb structure; pH 6.8 to 7.0; 2 to 4 inches thick; clear lower boundary.

B_2G 9 to 24 inches, reddish-yellow (7.5YR 6/5), strong-brown (7.5YR 5/8), and light yellowish-brown (10YR 6/4) loam to light silt loam; strongly mottled; weak medium blocky to fine and medium crumb structure; slightly firm in place but friable when removed; contains coarse limestone and igneous pebbles and small stones; pH 7.0 to 7.5; 12 to 18 inches thick; gradual lower boundary.

C 24 inches+, light yellowish-brown (10YR 6/4) highly calcareous gritty loam till derived mainly from limestone; a few faint mottles of yellowish brown (10YR 5/4); weak medium platy structure; firm when moist and moderately compact and hard in place; about 30 percent consists of coarse limestone pebbles and boulders with some gneissic material.

Range in characteristics: The texture of the surface soil is generally silt loam, but some areas are included in which the texture is loam or fine sandy loam. In many places the soil overlies windblown deposits of very fine sand and coarse silt or sediments laid down in local lakes. In these areas the uppermost 12 to 18 inches is made up of very fine sand and silt. The depth to limestone bedrock ranges from 1 to more than 4 feet. In the shallowest areas the soil consists only of a dark, highly organic surface layer and a lighter gray, highly mottled layer that lies just above the bedrock.

Relief: Nearly level to gently sloping.

Drainage. Somewhat poor to poor. Surface runoff is slow, and internal drainage is slow to very slow.

Native vegetation: Elm, soft maple, whitecedar, and willow.

MAPPING UNITS

The following mapping units are in the Kendaia series:

Kendaia silt loam, 0 to 3 percent slopes (KbA; Group 20).
Kendaia silt loam, 3 to 8 percent slopes (KbB; Group 19).
Kendaia silt loam, shallow, 0 to 3 percent slopes (KcA; Group 32).—The depth to bedrock in this soil ranges from 10 to 24 inches. Where the depth to bedrock is as much as 24 inches, the soil is similar to the soil described for the series. Where the soil is less than 12 inches deep, the surface layer is 8 to 10 inches thick and is black and highly organic. In these places there is a light-gray, highly mottled horizon immediately above the bedrock.
Kendaia silt loam, shallow, 3 to 8 percent slopes (KcB; Group 32).

Kendaia very stony silt loam, 0 to 15 percent slopes (KdB; Group 39).—This soil occurs in low areas. It contains many boulders and stones, some of which were moved from adjacent fields by man and dumped onto this soil.

Lobdell Series

The soils of the Lobdell series are moderately well drained to somewhat poorly drained. They have formed from sediments that were derived mainly from shale and sandstone but partly from limestone. They occur on first bottoms along the streams that flow across the high-lime region between the Tug Hill Plateau and the Black River.

These soils are in the same catena as the well-drained Chagrin soils, the poorly drained to somewhat poorly drained Wayland soils, and the very poorly drained Sloan soils. In contrast to the Eel and Genesee soils, which also have formed in sediments washed from upland soils but which are alkaline throughout, the Lobdell soils have an acid surface layer and subsoil. The Lobdell soils belong to the Alluvial great soil group.

Typical profile (Lobdell silt loam—cultivated):

A_p 0 to 8 inches, grayish-brown (10YR 5/2) to dark grayish-brown (10YR 4/2) silt loam; strong medium crumb structure; very friable; pH 5.5 to 5.8; 6 to 10 inches thick; clear lower boundary.

C_1 8 to 20 inches, brown (10YR 5/3) silt loam; weak medium to fine crumb structure; very friable; darker colored material from the surface horizon in most of the worm-holes and root channels; in places faintly mottled with strong brown and yellowish brown in the lower part; pH 5.6 to 5.9; 10 to 15 inches thick; diffuse lower boundary.

C_2 20 inches+, grayish-brown (10YR 5/2) silt loam; common distinct mottles of light yellowish brown (10YR 6/4) and brownish yellow (10YR 6/6); weak fine and medium crumb structure; friable; variable within short distances at depths below 20 inches, and shaly gravel occurs in places; pH 6.0 to 6.5, at depths of 2 feet, to neutral, at depths of 3 or 4 feet.

Range in characteristics: The texture of the plow layer ranges from sandy loam to silt loam or shaly silt loam. The subsoil is gravelly or shaly.

Relief: Nearly level.

Drainage: Moderately good, but soils are subject to periodic flooding. Internal drainage is slow.

Native vegetation: Deciduous forest, chiefly elm, soft maple, and whitecedar.

MAPPING UNITS

The following mapping units are in the Lobdell series:

Lobdell silt loam, 0 to 2 percent slopes (LbA; Group 12).

Lobdell shaly silt loam, 0 to 3 percent slopes (LaA; Group 12).—This soil occurs on alluvial fans and has developed mainly from dark-colored shales. It shows little profile development and is shaly from the surface downward.

Lyons Series

The soils of the Lyons series are very poorly drained. They have developed on calcareous glacial till derived from limestone and from varying amounts of shale and sandstone, with some gneiss and granite.

These soils are in the same catena as the well drained Nellis soils, the moderately well drained to somewhat poorly drained Amenia soils, and the poorly drained to somewhat poorly drained Kendaia soils. They are also in the same catena as the Dover soils and are associated with them. They are in the Humic Gley great soil group.

Typical profile (Lyons silt loam—in pasture):

A_1 0 to 8 inches, black (10YR 2/1) silt loam, high in organic matter; strong medium to fine granular structure; friable when moist; pH 6.8 to 7.0; 6 to 10 inches thick; abrupt lower boundary.

G_1 8 to 12 inches, gray (10YR 5/1) loam to light silt loam; many, medium, faint mottles of light yellowish brown and brown; moderate medium blocky structure; slightly firm when moist; old root channels are filled with material from the dark-colored surface soil; pH 6.4 to 6.6; 3 to 5 inches thick; gradual lower boundary.

G_2 12 to 24 inches, dark grayish-brown (10YR 4/2) loam to silt loam; common, medium, distinct or prominent mottles of strong brown (7.5YR 5/8) occurring as vertical streaks; moderate coarse blocky structure; firm when moist and nonsticky and nonplastic when wet; many stones and pebbles; pH 7.0 to 7.5; 10 to 14 inches thick; gradual lower boundary.

C 24 to 48 inches, grayish-brown (10YR 5/2) sandy glacial till consisting mainly of limestone but with some granite and gneiss; moderate medium platy structure; firm; the water table is at a depth of 24 inches or above during most of the year; calcareous.

Range in characteristics: Except in the shallow phase, the depth to carbonates is between 12 and 30 inches. In depressed areas a silty deposit has washed onto this soil from adjacent higher soils or has been blown onto the soil by wind. The texture of the surface horizon ranges from fine sandy loam to heavy silt loam.

Relief: Level, depressed, or very gently sloping.

Drainage: Very poor. Surface runoff and internal drainage are very slow.

Native vegetation: Elm, soft maple, willow, alder, and whitecedar.

MAPPING UNITS

The following mapping units are in the Lyons series:

Lyons silt loam, 0 to 3 percent slopes (LcA; Group 33).

Lyons silt loam, shallow, 0 to 3 percent slopes (LdA; Group 39).—This soil has a highly organic surface layer that is 8 to 10 inches thick and a thin, gray horizon immediately above the limestone bedrock. The depth to bedrock is 10 to 24 inches.

Lyons very stony silt loam, 0 to 3 percent slopes (LeA; Group 39).—This soil occurs in very poorly drained areas that have never been cultivated. In addition to the many original stones and boulders, stones and boulders that were removed from adjacent soils have been dumped onto some areas of this soil.

Madalin Series

The soils of the Madalin series are poorly drained to very poorly drained and are medium textured to fine textured. They have developed on glaciolacustrine sediments derived from shale and limestone. The soils occupy flat and depressed areas in the limestone section west of the Black River.

These soils are in the same catena as the well drained Hudson soils and the somewhat poorly drained to moderately well drained Rhinebeck soils. They occur in association with other members of the catena and with soils of the Nellis and Amenia series. The Madalin soils are somewhat similar in drainage to the Scantic soils but contain less clay and are more alkaline. They are in the Low-Humic Gley great soil group.

Typical profile (Madalin silt loam—in pasture):

A_{1p} 0 to 8 inches, dark gray (10YR 4/1) to very dark gray (10YR 3/1) silt loam; strong medium crumb structure; friable; pH 6.1 to 6.5; 6 to 10 inches thick; clear lower boundary.

A_2G 8 to 15 inches, brown (7.5YR 5/2) silt loam; many, medium, faint mottles of yellowish brown (10YR 5/4); weak medium subangular blocky structure but breaks

easily to medium crumb; slightly firm; pH 6.3 to 6.6; 6 to 8 inches thick; gradual lower boundary.

B_2G 15 to 26 inches, dark grayish-brown (10YR 4/2) heavy silt loam; common, medium, distinct mottles of pale brown (10YR 6/3) and grayish brown (10YR 5/2); moderate medium blocky structure; firm; pH 6.5 to 7.0; 8 to 10 inches thick; gradual lower boundary.

C 26 to 38 inches, dark grayish-brown (10YR 4/2) heavy silt loam or silty clay loam; a few faint to distinct mottles of brown and gray; moderate to strong blocky structure; firm; pH 7.5+.

Range in characteristics: The texture of the surface soil is normally silt loam, but in some places it is silty clay loam. The typical soil is poorly drained, but a few included areas are very poorly drained. In the upper part of the solum, the reaction is slightly acid to alkaline. In the lower part of the subsoil and in the substratum, the pH is 7.0 or more.

Relief: Level or slightly depressed.

Drainage: Poor. Surface runoff is slow and internal drainage is very slow. Most of the areas receive water from adjacent, higher areas.

Native vegetation: Elm, soft maple, and whitecedar.

MAPPING UNIT

The following mapping unit is the only soil of the Madalin series mapped in this county:

Madalin silt loam, 0 to 2 percent slopes (MaA; Group 30).

Made Land

This mapping unit is made up of dumps, fills, and other areas large enough to delineate on the map and that are the result of mixing or filling with soil, rock, or refuse. The material shows no profile development and has no agricultural value. The areas are mainly near villages.

MAPPING UNIT

Made land (MbA; not placed in a management group).

Manheim Series

The soils of the Manheim series are moderately well drained to somewhat poorly drained. They have developed in neutral to mildly calcareous glacial til . The till was derived mainly from black, weakly calcareous shale, and this dark color is reflected in the soils.

These soils are in the same catena as the well-drained Mohawk soils, the poorly drained to somewhat poorly drained Ilion soils, and the very poorly drained Fonda soils. They lack the distinct A_2 horizon of the Turin soils and are less siliceous. They have no fragipan and are not so acid as the Camroden soils. These soils are darker colored, finer textured, and contain more shale than the Amenia soils. All of these soils have similar drainage. The Manheim soils are Gray-Brown Podzolic-Brown Forest intergrades.

Typical profile (Manheim silt loam—cultivated):

A_1 0 to 7 inches, very dark brown (10YR 2/2) silt loam; moderate fine to medium crumb structure; very friable; slightly sticky and plastic when wet; pH 6.6 to 6.8; 5 to 8 inches thick; clear lower boundary.

B_1 7 to 18 inches, brown to dark-brown (7.5YR 4/4) silt loam; friable; moderate to strong medium crumb structure; much surface soil is mixed with this horizon, apparently by the action of worms; sticky and plastic when wet; pH 6.8 to 7.0; 6 to 10 inches thick; clear lower boundary.

B_{2g} 18 to 28 inches, very dark grayish-brown (10YR 3/2) silt loam; common, medium, faint mottles of yellowish brown (10YR 5/8); moderate medium subangular blocky structure; friable when moist; pH 7.0; 8 to 12 inches thick; gradual lower boundary.

B_{3g} 28 to 38 inches, heavy silt loam; many medium mottles of yellow (10YR 7/8), yellowish brown (10YR 5/8), and dark brown (10YR 4/3); moderate medium platy structure; friable when moist and slightly firm in place; many fragments of black shale and some pebbles and stones of gneiss; pH 7.0 to 7.3; 10 to 16 inches thick; gradual lower boundary.

C 38 inches+, dark grayish-brown (10YR 4/2) loam to silt loam faintly mottled with brownish yellow (10YR 6/8); crudely arranged thick plates that break to medium blocks; friable when moist and moderately plastic when wet; many fragments of soft, partly decomposed black shale; mildly alkaline to calcareous.

Range in characteristics: The texture of the surface soil ranges from silt loam to loam. The soil is predominately moderately well drained, but some included areas are somewhat poorly drained, particularly where the soil occurs near the Ilion soils. Where the soil is transitional to the Amenia soils, it is lighter in color and there is an increasing amount of limestone in the parent material. The pH is normally more than 6.0 throughout, but some areas that have a pH of less than 6.0 are mapped with this unit.

Relief: Nearly level to moderately sloping.

Drainage: Moderately good to somewhat poor. Surface runoff and internal drainage are medium to slow. In places the soil receives seepage from higher areas.

Native vegetation: Northern hardwoods; sugar maple and beech are dominant, but some black cherry, white ash, hickory, basswood, and elm are included.

MAPPING UNITS

The following mapping units are in the Manheim series:

Manheim silt loam, 0 to 3 percent slopes (McA; Group 13).
Manheim silt loam, 3 to 8 percent slopes (McB; Group 7).

Manlius Series

The soils of the Manlius series have developed from thin-bedded acid shale or from thin deposits of glacial till composed mainly of shale fragments. They occur on old shale outcrops on strong to steep slopes. The soils are shallow and medium textured and have a high content of shale fragments. They overlie broken shale bedrock or till composed of loose shale.

These well-drained soils are the only soils of their catena mapped in Lewis County. They are associated with Camroden and Pinckney soils and in places with the Marcy soils or with the shallow phase of the Gage soils. Mapped with them are some areas in which the solum is similar to that of the typical profile, although the soil was formed in deep deposits of loose shale fragments. The Manlius soils are weak Podzols.

Typical profile (Manlius silt loam—undisturbed):

A_0 1 to 0 inch of black humus matted with fine roots; pH 4.0 to 4.5; 1 to 3 inches thick; abrupt lower boundary.

A_2 0 to 1 inch, light brownish-gray (10YR 6/2) to dark grayish-brown (10YR 4/2) silt or silt loam; the color value varies according to the amount of mixing of organic material from the humus layer; very weak very fine crumb structure; very friable; pH 4.5 to 5.0; ½ to 2 inches thick; abrupt lower boundary.

B_{21} 1 to 6 inches, yellowish-brown (10YR 5/8 to 5/6) shaly silt loam; very weak very fine crumb structure; very friable; pH 4.5 to 5.0; 4 to 6 inches thick; gradual lower boundary.

B_{22} 6 to 18 inches, yellowish-brown (10YR 5/4) shaly or very shaly silt loam; very weak very fine crumb struc-

ture; very friable; pH 4.5 to 5.0; 10 to 14 inches thick; gradual lower boundary.

B_3C 18 to 30 inches, mass of fine shale fragments interspersed with blocks of shale that are a few inches to more than 12 inches across; grayish-brown (10YR 5/2) to dark grayish-brown (10YR 4/2), and in places dark yellowish-brown (10YR 4/4), silt loam fills the spaces between the shale fragments; fragments and blocks of shale are coated with olive-brown to grayish-brown silty material that has a very weak fine crumb structure; loose or very friable; pH 4.5 to 5.0; 10 to 18 inches thick; diffuse lower boundary.

D_r 30 inches +, grayish-brown to dark grayish-brown shale commonly somewhat broken and displaced along joint planes; the surfaces in cracks and on the upper side of exposed shale strata are coated with olive to olive-brown silty material; the fines, or powdered shale, have a pH of 5.0 to 5.5.

Range in characteristics: The depth of the soil over bedrock ranges from 12 to 36 inches. Some small areas of shallow, moderately well drained Camroden silt loam are included with this soil.

Relief: Gently sloping to steep.

Drainage: Good but ranges from moderate to excessive. Surface runoff is medium to rapid, and internal drainage is medium.

Native vegetation: Northern hardwoods; hard maple and beech are dominant, but some stands include hemlock and white pine.

MAPPING UNITS

The following mapping units are in the Manlius series:

Manlius silt loam, 0 to 8 percent slopes (MdB; Group 34).

Manlius silt loam, 8 to 15 percent slopes (MdC; Group 34).

Manlius silt loam, 15 to 35 percent slopes (MdD; Group 37).—This soil occurs on the steep, east-facing slopes of the Tug Hill escarpment. It is generally shallower to bedrock than the other Manlius soils that occupy less steep slopes. The cleared areas are eroded. They are used as permanent pasture or have been abandoned.

Marcy Series

The soils of the Marcy series are poorly drained. They have developed from glacial till of Late Wisconsin age. The till was derived from gray and dark-gray shales and from thin-bedded sandstone.

These soils are in the same catena as the well drained Pinckney soils, the moderately well drained to somewhat poorly drained Camroden soils, and the very poorly drained Alden soils, and they are associated with these soils. They have a less strongly expressed fragipan and a less acid solum than the Gage soils, which occupy a similar position in the catena. The soils of the Marcy series belong to the Low-Humic Gley great soil group.

Typical profile (Marcy silt loam—cultivated):

A_{1p} 0 to 8 inches, very dark gray (10YR 3/1) silt loam; grayish brown (2.5Y 5/2 to 10YR 5/2) when dry; friable; when in sod, has moderate medium crumb structure; pH 5.5 to 6.0; 7 to 10 inches thick; distinct lower boundary.

A_2G 8 to 13 inches, grayish-brown (2.5Y 5/2) silt loam; many fine to medium yellowish-brown (10YR 5/4) mottles; weak medium crumb to very weak thin platy structure; slightly firm; pH 5.5 to 6.0; 4 to 6 inches thick; clear lower boundary.

B_2G 13 to 24 inches, very dark grayish-brown (2.5Y 3/2) to dark grayish-brown (2.5Y 4/2) heavy silt loam or silty clay loam; many fine olive-brown (2.5Y 4/4) and light olive-brown (2.5Y 5/4) mottles; compound very coarse prismatic and weak medium to fine subangular blocky structure; faces of prisms coated with gray (2.5Y 5/1) clay, and some faces of weak blocks have similar, but discontinuous, coats; very firm when moist and very hard when dry; pH 5.5 to 6.0; 10 to 14 inches thick; gradual lower boundary.

B_3G 24 to 36 inches, dark grayish-brown (2.5Y 4/3) silt loam to light silty clay loam; many, medium, olive-brown mottles; weak very coarse prisms that are coated gray (5Y 5/1) and become less distinct with depth; very weak to weak medium blocky structure within prisms; firm when moist and hard or very hard when dry; pH 6.5 to 7.5 but more alkaline as depth increases; 12 to 16 inches thick; diffuse lower boundary.

C_g 36 to 48 inches, dark grayish-brown (2.5Y 4/2 to 4/3) silt loam; a few light olive-brown mottles that decrease in number with depth; weak medium angular blocky to crude very thick platy structure; firm; pH 7.0 to 7.5; in places calcareous at depths of 4 to 5 feet.

Range in characteristics: The color of the B and C horizons varies according to the amount of black shale in the till. The B horizons range in texture from silt loam to silty clay loam and become less firm as the content of clay increases. The B horizons are clayey but have the characteristics of a weak fragipan. In some places the entire solum has a pH of more than 6.0.

Relief: Nearly level to gently sloping; slopes are slightly concave.

Drainage: Poor. Surface runoff is slow to medium, and internal drainage is very slow. In places it receives runoff from adjacent soil.

Native vegetation: Soft maple, elm, beech, hard maple, and some hemlock; in places that are more acid, red spruce and balsam are dominant.

MAPPING UNITS

The following mapping units are in the Marcy series:

Marcy silt loam, 0 to 3 percent slopes (MeA; Group 30).

Marcy silt loam, 3 to 8 percent slopes (MeB; Group 19).

Melrose Series

The soils of the Melrose series are well drained. They have developed on sandy gravel-free outwash or deltaic deposits. The deposits were derived mainly from gneiss and overlie glaciolacustrine silts and clays that occur at depths of 24 to 36 inches. The soils are mainly east of the Black River.

These soils are in the same catena as the moderately well drained to somewhat poorly drained Elmwood soils, the poorly drained to somewhat poorly drained Swanton soils, and the very poorly drained Whately soils. They are associated with the Buxton and Scantic soils that have developed in silt and clay. They are also associated with the Essex and Gloucester soils that have formed in glacial till and that are on adjacent uplands. The soils of the Melrose series are weak Podzols.

Typical profile (Melrose sandy loam—cultivated):

A_p 0 to 8 inches, dark-brown (10YR 4/3) sandy loam; moderate to strong medium and fine crumb structure; very friable when moist and loose when dry; limed to a pH of 6.5, but pH is 5.0 to 5.2 in natural state; 6 to 8 inches thick; abrupt lower boundary.

B_{21} 8 to 12 inches, strong-brown (7.5YR 5/8) coarse sandy loam to sandy loam; moderate to weak very fine crumb structure; very friable when moist and loose when dry; pH 5.4 to 5.6; 3 to 5 inches thick; clear lower boundary.

B_{22} 12 to 17 inches, brown (7.5YR 5/4) to strong-brown (7.5YR 5/6) sandy loam; weak very fine crumb structure; very friable; pH 5.4 to 5.6; 4 to 6 inches thick; abrupt lower boundary.

B_3 17 to 24 inches, yellowish-brown (10YR 5/4) light silt loam to very fine sandy loam; very weak very fine crumb structure; friable when moist and slightly

sticky and plastic when wet; firmer in place than the horizons above; pH 5.5 to 5.7; 6 to 8 inches thick; gradual lower boundary.

D_1 24 to 36 inches, brown (10YR 5/3) silt; coarse weak medium to thick platy structure; slightly firm when moist, hard when dry, and sticky and plastic when wet; pH 5.5 to 5.7; 12 to 18 inches thick; gradual lower boundary.

D_2 36 to 48 inches, dark grayish-brown (10YR 4/2) varved silt and clay; very weak medium to coarse blocky structure; firm when moist; pH 5.8 to 6.2; becomes more alkaline with depth but commonly is not calcareous.

Range in characteristics: To depths of about 17 inches, the texture ranges from medium to coarse sandy loam. In most places an undisturbed profile under forest has an incipient A_2 horizon that is mixed with the B horizon when the soil is cultivated. In places the soil above the silt is faintly mottled. Depth to the layer of silt and clay ranges from 18 to 48 inches, but in most places it is between 24 and 36 inches.

Relief: Nearly level to gently rolling. The slopes are dominantly 3 to 8 percent.

Drainage: Good. Surface runoff is medium. Internal drainage is medium through the sandy solum but slow through the silt and clay in the substratum.

Native vegetation: Northern hardwoods; dominantly hard maple, beech, and yellow birch, but includes some white pine and hemlock.

MAPPING UNITS

The following mapping units are in the Melrose series:

Melrose sandy loam, 0 to 6 percent slopes (MfB; Group 4).
Melrose sandy loam, 6 to 12 percent slopes (MfC; Group 15).

Mohawk Series

The soils of the Mohawk series are well drained and are moderately fine textured. They have developed in calcareous glacial till derived mainly from very dark brown to black, mildly calcareous Utica shale. The dark color of the soils comes from the color of the shale.

The Mohawk soils are in the same catena as the moderately well drained to somewhat poorly drained Manheim soils, the poorly drained to somewhat poorly drained Ilion soils, and the very poorly drained Fonda soils. They occur in association with these soils. They are also associated with the Poland soils, which have formed from material containing less black shale, and have a distinct A_2 horizon. The texture of the Mohawk soils is similar to that of the moderately to weakly expressed Gray-Brown Podzolic soils, and their A_2 horizon is very weak or absent. The soils of the Mohawk series are Gray-Brown Podzolic-Brown Forest intergrades.

Typical profile (Mohawk silt loam—cultivated):

A_p 0 to 8 inches, very dark brown (10YR 2/2) to very dark grayish-brown (10YR 3/2) silt loam; moderate medium crumb structure; friable; thickness ranges from 6 to 10 inches, depending on depth of plowing; pH 6.0 to 7.0; clear lower boundary.

B_1 8 to 15 inches, very dark grayish-brown (10YR 3/2) to dark-brown (10YR 4/3) heavy silt loam; moderate to weak medium and fine subangular blocky structure; friable; distinct clayflow surfaces occur in a few places, mainly in small pores but in places on the faces of peds; pH 6.0 to 7.0; 6 to 8 inches thick; gradual lower boundary.

B_2 15 to 36 inches, very dark grayish-brown (10YR 3/2) to dark-brown (10YR 4/3) silty clay loam; moderate to weak medium subangular blocky structure that becomes coarser with depth; friable; in many places clayflow surfaces occur on peds and in fine pores; pH 6.5 to 7.5; 18 to 24 inches thick; diffuse lower boundary.

C_1 36 inches+, very dark grayish-brown (10YR 3/2) to dark grayish-brown (10YR 4/2) heavy silt loam or silty clay loam that is faintly mottled in some places; contains many fragments of black shale; moderate medium blocky structure; slightly firm; upper part is noncalcareous in places but becomes calcareous with depth; a few clayflow surfaces in upper part of the noncalcareous material.

Range in characteristics: The texture of the surface soil is generally silt loam, but there are many places where the texture is silty clay loam. The pH is normally more than 6.0 throughout the profile. In places, however, the pH is as low as 5.5 in the uppermost 18 inches. In some places there is enough limestone in the soil so that the color is lighter than normal. Here, the soil is transitional to the Nellis soils that have brown B horizons.

Relief: Gently sloping to moderately steep; slopes are dominantly 3 to 15 percent.

Drainage: Good. Surface runoff is medium to rapid, and internal drainage is medium. Some moderately well drained areas are included.

Native vegetation: Northern hardwoods; dominantly hard maple and beech but some basswood, white ash, and black cherry.

MAPPING UNITS

The following mapping units are in the Mohawk series:

Mohawk silt loam, 2 to 8 percent slopes (MgB; Group 3).
Mohawk silt loam, 8 to 15 percent slopes (MgC; Group 14).
Mohawk silt loam, 15 to 25 percent slopes (MgD; Group 26).

Nellis Series

The soils of the Nellis series are well drained and are medium textured. They have developed from firm, highly calcareous glacial till of Late Wisconsin age. The till was derived mainly from limestone. In many places in the uppermost 12 to 18 inches of the soils there are glaciolacustrine deposits of very fine sand, coarse silt, or similar materials deposited by wind.

These soils are in the same catena as the moderately well drained to somewhat poorly drained Amenia soils, the poorly drained to somewhat poorly drained Kendaia soils, and the very poorly drained Lyons soils. They are similar to the Dover soils, but the Dover soils are redder and more sandy. The Nellis soils are in the Brown Forest great soil group.

Typical profile (Nellis loam—cultivated):

A_p 0 to 7 inches, very dark grayish-brown (10YR 3/2) loam; moderate medium crumb structure; very friable; pH 5.5 to 7.0; A_1 horizon in forested areas is 4 to 6 inches thick; abrupt lower boundary.

B_{21} 7 to 12 inches, brown (10YR 5/3) to yellowish-brown (10YR 5/4) loam; very weak medium and fine subangular blocky structure; blocks fall apart easily, and structure is then weak to moderate medium and fine crumb; very friable; pH 5.2 to 7.0; 3 to 8 inches thick; gradual lower boundary.

B_{22} 12 to 20 inches, brown (10YR 5/3) to dark grayish-brown (10YR 4/2) light loam; weak medium and fine crumb structure; very friable; pH 6.0 to 7.0; 6 to 15 inches thick; gradual lower boundary.

B_{23} 20 to 26 inches, brown (10YR 4/3) to dark grayish-brown (10YR 4/2) fine sandy loam or loam; weak medium and fine crumb structure; very friable; pH 7.0 to 7.5; 4 to 12 inches thick; clear lower boundary.

C 26 inches+, grayish-brown (10YR 5/2) fine sandy loam; weak to moderate medium angular blocks crudely arranged in very thick plates; firm; calcareous.

Range in characteristics: In many places a thin deposit of lake-laid or windblown very fine sand and coarse silt overlies the soil. The color values of the soil, when dry, are 1 to 2 units higher than those given, which are for moist soil. The color hues are chiefly 10YR, but in places they are 7.5YR in the solum. Typically the B_{23} horizon has been darkened slightly by organic matter, and in places it has a slight concentration of silicate clay just above the substratum. The B_{23} horizon is present in most of the deep soils, but its development ranges from weak to strong within distances of a few feet.

Many of the characteristics of the solum vary as the depth of leaching of the carbonates increases. The variations may occur erratically within a single field or as trends over long distances. In some places carbonates occur at depths of 18 inches. In these places the A_1 horizon is 6 inches thick, the A_1 and B horizons are brown to dark brown, and the soil is neutral throughout. In other places the carbonates have leached to a depth of 40 inches. Here, the soil has an A_1 horizon that is 3 or 4 inches thick and the B horizon is yellowish brown. In these places the upper part of the solum is generally strongly acid, the pH increasing with depth, but in some of these places, the pH is more than 6.0 throughout. The significance of these variations is less important in areas that have been cultivated and limed.

In these soils depth to limestone bedrock ranges from 15 inches to many feet. Where the soil is less than 24 inches over bedrock, the C horizon is lacking but the A_1 and B horizons are typical of the soil described for the series.

Relief: Nearly level to moderately steep; slopes are dominantly 2 to 8 percent. The soils occur mostly on terracelike areas that overlie nearly level bedded limestone, but some areas are on ground moraines or on drumlins.

Drainage: Good. Surface runoff is medium to very rapid, and the permeability of the substratum is moderate. The water-holding capacity is high.

Native vegetation: Dominantly sugar maple with white ash, beech, basswood, hophornbeam, red maple, and, in places, a few conifers..

MAPPING UNITS

The following mapping units are in the Nellis series:

Nellis loam, deep, 2 to 8 percent slopes (NeB; Group 3).

Nellis loam, deep, 8 to 15 percent slopes (NeC; Group 14).

Nellis loam, moderately deep, 2 to 8 percent slopes (NcB; Group 3).—Except that depth to bedrock is shallower and the moisture-supplying capacity is not so high, this soil is similar to the typical soil described for the series. The depth to limestone bedrock ranges from 24 to 40 inches. During prolonged dry periods, the lack of available moisture limits the growth of plants and yields are less than for the typical soil.

Nellis loam, moderately deep, 8 to 15 percent slopes (NcC; Group 14).

Nellis loam, moderately deep and deep, 15 to 25 percent slopes (NdD; Group 26).

Nellis loam, shallow, 0 to 8 percent slopes (NbB; Group 34).—The A and B horizons of this soil are similar to those of the typical soil, but the B horizon rests on bedrock. In the lower part of the B horizon, there is a dark grayish-brown layer high in organic matter. This layer has resulted because decomposed roots have accumulated immediately above the bedrock. The depth to limestone bedrock is between 10 and 24 inches.

Nellis loam, shallow, 8 to 15 percent slopes (NbC; Group 34).

Nellis loam, shallow, 15 to 25 percent slopes (NbD; Group 37).

Nellis loam, 25 to 35 percent slopes (NaE; Group 35).—This mapping unit is made up of deep and moderately deep phases of Nellis loam that occur on steep slopes. Except that the horizons are thinner and bedrock is generally closer to the surface, the soil has the same general horizon sequence as that described for the series.

Nellis very stony loam, 3 to 15 percent slopes (NgC; Group 38).—This soil has many boulders and stones of limestone and gneiss. It is too stony to use for crops, but it is used for permanent pasture. The soil has a low productive capacity and is too stony to be improved easily.

Nellis very stony loam, 15 to 35 percent slopes (NgD; Group 41).

Nellis loam, ledgy, 3 to 15 percent slopes (NfC; Group 37).—This soil has many outcrops and ledges of limestone. It occupies a series of limestone escarpments that run from north to south through the valley of the Black River. The areas are mostly rock and are not useful for agriculture. Most of the soil is in permanent pasture.

Nellis loam, ledgy, 15 to 35 percent slopes (NfD; Group 41).

Ondawa Series

The soils of the Ondawa series are well drained. They have formed on sediments derived mainly from gneiss, granite, and sandstone. The soils occur on bottom lands along rivers and small streams.

These soils are in the same catena as the moderately well drained to somewhat poorly drained Podunk soils, the poorly drained to somewhat poorly drained Rumney soils, and the very poorly drained Saco soils. They are associated with the Colton and Adams soils that occur on adjacent terraces. The Ondawa soils are more acid and are coarser textured than the Chagrin and Genesee soils that occur in similar positions, and their color is more nearly yellowish brown. The soils are in the Alluvial great soil group.

Typical profile (Ondawa loam—cultivated):

A_p 0 to 9 inches, dark grayish-brown (10YR 4/2) fine sandy loam to loam; fine to medium crumb structure; friable when moist and nonsticky and nonplastic when wet; pH 5.4 to 5.6; 8 to 10 inches thick; abrupt lower boundary.

C_1 9 to 20 inches, grayish-brown (10YR 5/2) to brown (10YR 5/3) sandy loam; weak very fine crumb structure; high in quartz but contains many dark-colored minerals; very friable; pH 5.4 to 5.6; 10 to 16 inches thick; gradual lower boundary.

C_2 20 to 48 inches, grayish-brown (10YR 5/2) loose fine sand; very weak very fine crumb structure to single grain; very friable; mainly quartz sand but contains some feldspar and ferromagnesian minerals; pH 5.4 to 5.6.

Range in characteristics: The texture of the surface soil ranges from loam to loamy fine sand. The lighter textured Ondawa soils have formed on sediments derived mainly from granite and gneiss. They occur on the bottom lands along the Black River and along streams that flow into the Black River from the east. The soils developed mainly from sandstone have a silt loam texture and are darker in color than those developed mainly from granite and gneiss. They occupy areas too small to map separately.

Relief: Nearly level.

Drainage: Good. Periodic floods occur most often in spring but also at other times during the year.

Native vegetation: Elm, soft maple, ash, hickory, alder, and willow.

MAPPING UNITS

The following mapping units are in the Ondawa series:

Ondawa loam, 0 to 2 percent slopes (OaA; Group 11).

Ondawa loamy sand, 2 to 5 percent slopes (ObB; Group 11).—This soil is made up of water-sorted deposits of fine sand and very fine sand. Its color is light yellowish brown. Except that

the surface layer has a somewhat darker color than the rest of the soil, there is little profile development. The relief is undulating, but in places it has been modified by wind action.

Peat and Muck

This undifferentiated soil group is made up of organic soils. The soils consist of both black, well-decomposed amorphous material and brown, partly decomposed plant material. Most of Peat and muck was derived from woody material, but some was derived from fibrous materials, as cattails, rushes, and sedges.

The reaction of these soils ranges from strongly acid to alkaline. The acid soils are associated with the Podzolic soils of the uplands. The ones that are alkaline are near Lake Bonaparte where crystalline limestone outcrops. All of the areas of Peat and muck are permanently wet. None of the areas have been drained.

MAPPING UNITS

The following two mapping units, differentiated by the thickness of the deposits, are shown on the soil map:

Peat and muck, deep (PbA; Group 40).—This mapping unit is made up of organic materials that are more than 24 inches thick.

Peat and muck, shallow (PaA, Group 40).—This mapping unit is made up of organic materials, 10 to 24 inches thick, that overlie sand and clay.

Petoskey Series

The soils of the Petoskey series are well drained. They have developed on deltas from gravel-free fine to medium sands derived from limestone, shale, and gneiss. The sands were laid down by streams that flowed from the Tug Hill Plateau and across the limestone outcrops. The soils occur in the valley of the Black River entirely on the west side of the river.

These soils are in the same catena as the moderately well drained Galen soils, the poorly drained to somewhat poorly drained Junius soils, and the very poorly drained to poorly drained Granby soils. They also occur in association w th Nellis, Hudson, and Kars soils. The Petoskey soils are coarser textured than the Kars soils and are free of gravel. They differ from the Hudson soils in being sandy rather than silty. The soils of the Petoskey series are in the Brown Forest great soil group.

Typical profile (Petoskey fine sandy loam—cultivated):

A_{1p} 0 to 7 inches, very dark brown (10YR 2/2) sandy loam to fine sandy loam; medium very fine crumb structure; very friable; pH 6.6 to 7.0; 6 to 8 inches thick; abrupt lower boundary.

B_{21} 7 to 12 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; very weak fine crumb structure to single grain; very friable; pH 6.5 to 6.8; 4 to 6 inches thick; clear lower boundary.

B_{22} 12 to 20 inches, brown (7.5YR 5/4) to dark-brown (7.5YR 4/4) loamy sand to fine sandy loam; weak fine crumb structure, when moist; single grain, when dry; very friable; pH 6.6 to 7.0; 6 to 10 inches thick; gradual lower boundary.

B_{23} 20 to 26 inches, yellowish-brown (10YR 5/4) loamy sand; single grain; loose and porous; pH 6.8 to 7.0; 5 to 8 inches thick; gradual lower boundary.

C 26 inches+, dark grayish-brown (10YR 4/2) loose, open, medium fine or coarse sand largely composed of quartz; derived from gneiss, shale, sandstone, and limestone; single grain; contains some fine gravel in places; calcareous or mildly alkaline.

Range in characteristics: The texture of the C horizon ranges from coarse to fine sand. The reaction of the soil varies. In places the surface soil and subsoil are neutral and the substratum is calcareous. Where the soil has developed from sands washed from areas east of the Black River, the pH is less than 6.0 to depths of 4 or 5 feet. Here, the soil is coarse textured and has a very high content of quartz sand. The typical soil does not contain gravel, but where it occurs on the first limestone escarpment west of the Black River and is associated with the Kars soils, some fine gravel occurs throughout the profile. In these areas, stratified sand and gravel occur in places in the deep substratum.

Relief: Gently rolling, hilly, and steep.

Drainage: Good to excessive. Runoff is medium to rapid, and internal drainage is very rapid.

Native vegetation: Northern hardwoods, dominantly hard maple and beech.

MAPPING UNITS

The following mapping units are in the Petoskey series:

Petoskey fine sandy loam, 0 to 3 percent slopes (PcA; Group 2).
Petoskey fine sandy loam, 3 to 8 percent slopes (PcB; Group 4).
Petoskey fine sandy loam, 8 to 15 percent slopes (PcC; Group 15).
Petoskey fine sandy loam, 15 to 25 percent slopes (PcD; Group 27).

Petoskey and Hartland fine sandy loams, 25 to 35 percent slopes (PdE; Group 35).—This undifferentiated soil group is made up of steep areas of Petoskey and Hartland soils. The soils of both series are sandy. The Hartland soil, however, has developed from very fine sand over silt, and the Petoskey soil is made up of medium and fine sand throughout. This mapping unit is too steep for crops. The areas are used for forest or have been abandoned.

Pinckney Series

The soils of the Pinckney series are well drained. They are medium textured and have well-expressed fragipans. These soils have developed in glacial till of Late Wisconsin age. The till was derived chiefly from dark-colored shale.

These soils are in the same catena as the moderately well drained to somewhat poorly drained Camroden soils, the poorly drained Marcy soils, and the very poorly drained Alden soils. They differ from the Camroden soils in having more pronounced degradation in the upper 6 inches of the fragipan and only incipient mottling in the lower part of the Podzol solum and in the fragipan. They are finer textured than the Empeyville soils, which are similar but have formed on glacial till derived from sandstone. The Pinckney soils are Podzols.

Typical profile (Pinckney silt loam—undisturbed):

A_0 2 to 0 inches, black humus held in a mat of fine roots; pH 4.5 to 5.0.

A_2 0 to 1 inch, light-gray (10YR 7/2) silt loam; very weak very fine crumb structure; friable; pH 4.5 to 5.0; ½ to 2 inches thick; abrupt lower boundary.

B_{21} 1 to 6 inches, yellowish-brown (10YR 5/6) silt loam; very weak very fine crumb structure; very friable; pH 4.5 to 5.0; 4 to 6 inches thick; gradual lower boundary.

B_{22} 6 to 20 inches, dark yellowish-brown (10YR 4/4) silt loam; weak medium and coarse crumb structure; friable; pH 5.0; 12 to 18 inches thick; clear lower boundary.

A'_2 20 to 25 inches, light brownish-gray (10YR 6/2) to light yellowish-brown (10YR 6/4) loam, very fine sandy loam, or silt loam; contains much coarse silt; weak medium platy structure, but weak very fine blocky structure when moist; a few medium yellowish-brown (10YR 5/4) mottles; friable; pH 5.0; 4 to 6 inches thick; abrupt lower boundary.

$B'_2A'_2$ 25 to 29 inches, very coarse columnar structure; tops of columns 5 to 8 inches across with light brownish-gray

coatings of coarse silt and very fine sand 1/2 to 1/8 inch thick; interiors grayish-brown (2.5Y 4/2) silt loam with weak medium and fine blocky to very thick platy structure, the blocks and plates covered by a very thin, discontinuous coating of brownish gray; firm to very firm; pH 5.0; 3 to 5 inches thick; gradual lower boundary.

B'_{21} 29 to 38 inches, grayish-brown (10YR 4/2 to 2.5Y 4/2) heavy silt loam; very coarse prismatic structure; interiors weak medium blocky structure; very firm; light brownish-gray (2.5Y 6/2) coats 1/4 to 1/16 inch thick and separated from prism interiors by strong-brown (7.5YR 5/6) streaks; clayflow deposits in voids and also on a few ped faces; pH 5.0 to 5.5; 8 to 10 inches thick; diffuse lower boundary.

B'_{22} 38 to 50 inches, grayish-brown (2.5Y 5/2) heavy silt loam; compound structure of weak coarse subangular blocks that have very dark grayish-brown (2.5Y 3/2 to 2/2) coats, and very weak fine subangular blocks; very firm; clayflow in voids and on some ped faces; pH 5.0 to 6.0; 10 to 15 inches thick; diffuse lower boundary.

B'_{3} 50 to 70 inches, grayish-brown (2.5Y 5/2) silt loam; very weak medium blocky structure; firm to very firm; a few clayflow surfaces on peds; pH 5.5 to 6.5; 18 to 24 inches thick; diffuse lower boundary.

C 70 inches+, grayish-brown (2.5Y 5/2) silt loam; weak medium blocky structure; firm; pH 5.8 to 7.0; becomes calcareous at depths ranging from 6 to more than 10 feet.

Range in characteristics: The color of the fragipan (designated by the prime symbol, as A′, B′) ranges in chroma and value from 4/3 to 4/1. Although the color hue is given as 2.5Y in most places, in some places it is 10YR. In some places in the A'_2 layer, pronounced yellowish-brown mottles occur, and in other places there are no mottles. The depth to the $B'_2A'_2$ layer ranges from 20 to 30 inches. The texture of the B'_{21} layer ranges from silt loam to light silty clay loam. In places, at depths of 36 inches, the pH of the soil is nearly 6.0, and in other places it remains near 5.0 to depths of almost 50 inches.

Relief: Convex slopes, mainly more than 5 percent, but in places as low as 3 percent.

Drainage: Good. Surface runoff is rapid, and internal drainage is slow to very slow. The soils receive little runoff from adjacent areas.

Native vegetation: Mainly sugar maple, beech, and hemlock.

MAPPING UNITS

The following mapping units are in the Pinckney series:

Pinckney silt loam, 3 to 8 percent slopes (PeB; Group 5).

Pinckney silt loam, 8 to 15 percent slopes (PeC; Group 16).

Pinckney silt loam, 15 to 25 percent slopes (PeD; Group 28).—This soil is generally more shallow than the typical soil, and the fragipan is not so strongly expressed.

Pinckney silt loam, 25 to 35 percent slopes (PeE; Group 35).—This soil has thinner horizons than the typical soil, and the depth to shale bedrock is less.

Pinckney silt loam, 15 to 35 percent slopes, eroded (PfE; Group 35).—This soil occurs in areas that have serious sheet and gully erosion. The areas were cleared and cultivated for a short time, and excessive runoff then removed all of the original surface soil and part of the subsoil. Because the areas are difficult to cultivate and productivity is low, they are now used for permanent pasture or have been abandoned.

Podunk Series

The soils of the Podunk series are moderately well drained to somewhat poorly drained. They have formed from sediments washed from soils underlain by acid, crystalline rocks. They occur mainly on the first bottoms of streams that flow into the Black River from the east.

These soils are in the same catena as the well-drained Ondawa soils, the poorly drained to somewhat poorly drained Rumney soils, and the very poorly drained Saco soils. They are in the Alluvial great soil group.

Typical profile (Podunk loam and fine sandy loam—cultivated):

A_p 0 to 9 inches, dark-brown (10YR 4/3) loam or fine sandy loam; strong medium to fine crumb structure; pH 5.5 to 5.6; 8 to 10 inches thick; abrupt lower boundary.

C_1 9 to 15 inches, yellowish-brown (10YR 5/4) loam; weak medium crumb structure; slightly firm in place but friable when crushed; pH 5.4 to 5.6; 5 to 8 inches thick; gradual lower boundary.

C_2 15 to 30 inches, brown (10YR 5/3) loam; common medium mottles of grayish brown (10YR 5/2); weak medium crumb structure; slightly firm; pH 5.4 to 5.6; 12 to 18 inches thick; diffuse lower boundary.

C_3 30 inches+, brown (10YR 5/3) to yellowish-brown (10YR 5/4) loam, silt loam, or fine sandy loam; a few faint mottles of grayish brown (10YR 5/2); firm in place; pH 5.5 to 5.7.

Range in characteristics: The texture of the surface soil ranges from fine sandy loam to loam or silt loam. In places, mainly along the minor streams, there is a small amount of gravel in the soil and beds of gravel occur at depths below 2 or 3 feet.

Relief: Nearly level.

Drainage: Moderately good but floods occur periodically.

Native vegetation: Elm, soft maple, willow, and alder.

MAPPING UNIT

Only one mapping unit of the Podunk series occurs in this county. It is an undifferentiated soil consisting of loam and fine sandy loam and has the profile described for the series.

Podunk loam and fine sandy loam, 0 to 2 percent slopes (PgA; Group 12).

Poland Series

The soils of the Poland series are well drained and are medium textured. They have developed from alkaline to weakly calcareous glacial till of Late Wisconsin age. The till is made up of dark-colored gray and black shale, sandstone, and varying amounts of granite.

These soils are in the same catena as the moderately well drained to somewhat poorly drained Turin soils, the poorly drained to somewhat poorly drained Ilion soils, and the very poorly drained Fonda soils. They are lighter in color than the Mohawk soils but are more acid and contain more siliceous material. They lack the distinct fragipan and Podzol solum of the Pinckney soils. The soils of the Poland series are in the Gray-Brown Podzolic great soil group.

Typical profile (Poland silt loam—cultivated):

A_p 0 to 6 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate medium crumb structure when under sod; friable; pH about 5.0 if the soil has not been limed; in forested areas the A_1 horizon is 2 to 4 inches thick; clear lower boundary.

A_2 6 to 16 inches, brown (10YR 5/3 to 5/4) silt loam; weak medium platy to moderate medium crumb structure; friable; pH 5.0 to 5.5; 8 to 16 inches thick; clear lower boundary.

B_{21} 16 to 22 inches, dark grayish-brown to dark-brown (10YR 4/2 to 4/3) heavy silt loam or silty clay loam; moderate medium subangular blocky structure; slightly firm; ped

faces are commonly coated with a thin layer of grayish-brown (10YR 5/2) silt or very fine sand, but coating decreases with depth; clayflow abundant in interior voids but not on ped faces; pH 5.2 to 6.0; 4 to 8 inches thick; gradual lower boundary.

B_{22} 22 to 36 inches, dark grayish-brown to dark-brown (10YR 4/2 to 4/3) silty clay loam or heavy silt loam; moderate medium subangular blocky structure; firm; clayflow conspicuous, but not continuous, on ped faces; pH 5.5 to 6.5; 10 to 18 inches thick; gradual lower boundary.

B_3 36 to 45 inches, olive-brown (2.5Y 4/3) to dark grayish-brown (10YR 4/2) heavy loam or silt loam; weak medium and coarse subangular blocky structure; firm; clayflow present but not conspicuous; pH 6.0 to 7.5; 6 to 12 inches thick; gradual lower boundary.

C 45 inches+, olive-brown (2.5Y 4/3) to dark grayish-brown (10YR 4/2) loam or silt loam; contains many dark-colored fragments of shale; weak to moderate medium blocky structure, the blocks generally crudely arranged in very thick plates; firm; clayflow inconspicuous or absent; pH 7.0+ to calcareous; in places calcareous throughout.

Range in characteristics: The color value of the soil, when dry, is 1 to 2 units higher than described for moist soil. Where the soil is transitional to the moderately well drained Turin soils, the lower part of the A_2 horizon is, in places, grayish-brown to brown loam. This material is comparable to that coating the peds in the B_{21} horizon. Where the soil is transitional to the Mohawk soils, it is darker than the typical soil in places and the depth to carbonates is less. Although carbonates occur in some of these places at depths of 3 to 3½ feet, the solum above is very strongly acid. In places where the soil contains a larger proportion of sandstone or granite than typical, the A horizons are predominantly loam and the B horizons are predominantly clay loam.

Relief: Undulating to moderately steep; the slopes are dominantly 3 to 15 percent, and most of them are convex.

Drainage: Good. Surface runoff is medium to rapid, and internal drainage is medium.

Native vegetation: Northern hardwoods; sugar maple dominant.

MAPPING UNITS

The following mapping units are in the Poland series:

Poland silt loam, 3 to 8 percent slopes (PhB; Group 3).
Poland silt loam, 8 to 15 percent slopes (PhC; Group 14).
Poland silt loam, 15 to 25 percent slopes (PhD; Group 26).
Poland and Mohawk silt loams, 25 to 35 percent slopes (PkE; Group 35).—This unit is made up of areas of Poland and Mohawk soils that occur on steep slopes. The soils are not suited to agriculture and are largely in forest.

Rhinebeck Series

The soils of the Rhinebeck series are somewhat poorly drained to moderately well drained. They have developed on glaciolacustrine deposits that are calcareous and brown to grayish brown in color.

These soils are in the same catena as the well-drained Hudson soils and the poorly drained to very poorly drained Madalin soils and are associated with them. The Rhinebeck soils are finer textured than the Hudson soils, and, in contrast to those soils, they have a mottled subsoil. They are also associated with the Nellis soils, which occur on adjacent higher areas and have formed in high-lime glacial till. The Rhinebeck soils are Gray-Brown Podzolic soils.

Typical profile (Rhinebeck silt loam—cultivated):

A_p 0 to 8 inches, dark-brown (10YR 4/3) silt loam; strong medium crumb structure; friable when moist and sticky and plastic when wet; pH 6.2 to 6.4; 7 to 9 inches thick; clear lower boundary.

A_2 8 to 12 inches, brown (10YR 5/3) to yellowish-brown (10YR 5/4) silt loam; weak medium subangular blocky structure, but the crude blocks break down so that the structure becomes medium to coarse crumb; pH 6.4 to 6.6; 3 to 5 inches thick; clear lower boundary.

B_{21g} 12 to 17 inches, brown (10YR 5/3) silty clay loam; common faint mottles of light brownish gray; moderate medium subangular blocky structure; firm when moist and sticky and plastic when wet; pH 6.4 to 6.6; 4 to 6 inches thick; gradual lower boundary.

B_{22g} 17 to 32 inches, yellowish-brown (10YR 5/4) silty clay loam; common, medium, distinct mottles of dark brown; strong medium angular blocky structure; firm when moist, hard when dry, and sticky and plastic when wet; clayflow surfaces abundant; pH 6.6 to 7.2; 14 to 18 inches thick; gradual lower boundary.

B_3 32 to 38 inches, brown (10YR 5/3) silty clay loam faintly mottled with dark brown; strong medium blocky structure; firm; pH 7.0 to 7.2; 6 to 8 inches thick; gradual lower boundary.

C 38 inches +, dark grayish-brown (10YR 4/2) silty clay loam; coarse prismatic structure but breaks to strong medium angular blocky; firm when moist and very firm when dry; calcareous.

Range in characteristics: The texture of the surface soil is normally light silt loam to silt loam, but silty clay loam occurs in places. In places there is a deposit, 8 to 10 inches thick, of sandy loam or loam that contains gravel washed from surrounding higher lying soils. In the wetter areas, the soil is grayer in color and mottling is stronger and closer to the surface than elsewhere.

Relief: Predominantly undulating, but some areas are nearly level and some are gently sloping. Some areas have slopes of 10 to 12 percent.

Drainage: Somewhat poor to moderately good. Surface runoff is medium and internal drainage is slow.

Native vegetation: Northern hardwoods; sugar maple and beech dominant, but includes yellow birch, black cherry, ash, basswood, and hickory.

MAPPING UNITS

The following mapping units are in the Rhinebeck series:

Rhinebeck silt loam, 1 to 6 percent slopes (RaB; Group 9).
Rhinebeck silt loam, 6 to 12 percent slopes (RaC; Group 18).

Ridgebury Series

The soils of the Ridgebury series are poorly drained to somewhat poorly drained and usually have fragipans. They have formed on glacial till of Late Wisconsin age. The till was derived from gneiss and granite.

These soils are in both the Essex and Gloucester catenas. The other members of these catenas are the moderately well drained to somewhat poorly drained Scituate soils and the very poorly drained Whitman soils. The Ridgebury soils occur in association with these soils. They are in the Low-Humic Gley great soil group.

Typical profile (Ridgebury stony loam—cultivated):

A_p 0 to 6 inches, very dark grayish-brown (10YR 3/2) stony loam; moderate fine crumb structure; friable; pH 5.5 to 5.8; 6 to 8 inches thick; abrupt lower boundary.

B_{2g} 6 to 12 inches, pale-brown (10YR 6/3) loam; many, medium faint to distinct mottles of strong brown

(7.5YR 5/6) and yellowish brown (10YR 5/6); weak medium to fine crumb structure; friable; pH 5.5 to 5.7; 5 to 7 inches thick; gradual lower boundary.

B'_{21g} 12 to 24 inches, pale-brown (10YR 6/3) or light brownish-gray (10YR 6/2) sandy loam; many, large, distinct mottles of strong brown (7.5YR 5/6) and dark yellowish brown (10YR 4/4); crude thick platy structure, but if plates are broken the structure becomes weak coarse blocky; firm; stony; pH 5.5 to 5.7; 10 to 15 inches thick; gradual lower boundary.

B'_{22g} 24 to 40 inches+, pale-brown (10YR 6/3) stony sandy loam; dark yellowish-brown (10YR 4/4) mottles; moderate medium to thick platy structure; very firm; compact and hard in place; pH 5.4 to 5.6.

Range in characteristics: The surface soil ranges in texture from loam to sandy loam and is stony to very stony. Where the soil is somewhat poorly drained, the surface soil is browner than that of the typical soil. The depth to the hardest part of the fragipan (B′ layers) ranges from 18 to 30 inches. Included with these soils are some small areas of poorly drained Leicester soils, which have not been mapped separately in this county. These included areas have no fragipan, or the fragipan is very weak.

Drainage: Poor to somewhat poor. Surface runoff is slow, and internal drainage is slow to very slow.

Native vegetation: Elm, soft maple, alder, aspen, and some whitecedar.

MAPPING UNITS

The following mapping units are in the Ridgebury series:

Ridgebury stony loam, 0 to 5 percent slopes (RbB; Group 20).

Ridgebury soils, extremely stony, 0 to 8 percent slopes (RcB; Group 43).—Except that the surface is covered with stones and boulders, these soils are similar to the typical soil described for the series. They are too stony for crops. The areas that have been cleared are used for permanent pasture or are idle.

Riverwash

This miscellaneous land type is made up of gravel bars, bare rock that is in old stream channels, and wide, barren, streambeds that are free of water except when the streams are at flood stage. Much of it occupies long, narrow areas along the major streams. The land has low agricultural value. It is generally used for permanent pasture along with adjoining areas, but it furnishes little grazing because of the gravel, stones, and boulders on the surface.

MAPPING UNIT

Riverwash is represented only by the following mapping unit:

Riverwash (RdA; Group 44).

Rockland

Rockland is a miscellaneous land type. Rock outcrops and exposures of bare bedrock dominate the mapping units.

MAPPING UNITS

The following mapping units are classed as Rockland:

Rockland, gneiss (ReE; Group 41).—This mapping unit consists of 25 to 40 percent or more of bare outcrops of Adirondack gneiss. The areas range in size from less than 1 acre to more than 1,000 acres. This mapping unit occurs in all parts of the county east of the Black River, particularly in the town of Croghan. Only a small acreage occurs on the west side of the county, and it is near the river. In some places the material between the rocks consists of well-drained Gloucester or Essex soils, and in others it is made up of poorly drained Ridgebury or Whitman soils. This land type is poorly suited to agriculture, but some large areas are used as permanent pasture. Other areas are covered with trees of poor quality.

Rockland, limestone (RfE; Group 41).—Bare exposures of limestone bedrock occupy much of this mapping unit. The exposures occur at the tops of limestone ledges that run north and south through the valley of the Black River and on outcrops of crystalline limestone in the town of Diana. The land has little value for agriculture, but part of it is in permanent pasture. There are several small quarries on the areas, where limestone is crushed for use in building roads.

Rough Broken Land

This miscellaneous land type is made up of steep to vertical walls of exposed shale bedrock. The exposures occur along the streams that cut into the rock and form V-shaped gorges along the east and north sides of Tug Hill. These gorges are mostly too steep for trees to get a foothold, but on some of them along the smaller streams there is a forest cover of maple, beech, and hemlock. A spectacular example of Rough broken land is the gorge at Whetstone Gulf. Here, bare shale cliffs several hundred feet high are exposed. This area has been set aside as a State park.

MAPPING UNIT

Rough broken land is represented by only one mapping unit:

Rough broken land (RgE; Group 41).

Rumney Series

The soils of the Rumney series are poorly drained to somewhat poorly drained and occur on first bottoms along streams. They have formed on sediments washed from upland soils developed on glacial till. The till was derived mainly from gneiss.

These soils are in the same catena as the well drained Ondawa soils, the moderately well drained to somewhat poorly drained Podunk soils, and the very poorly drained Saco soils. They lie next to Adams and Colton soils that occur on terraces. The Rumney soils are in the Low-Humic Gley great soil group.

Typical profile (Rumney silt loam—cultivated):

A_p 0 to 9 inches, very dark grayish-brown (10YR 3/2) silt loam; strong medium granular or crumb structure; friable; pH 5.0 to 5.4; 8 to 10 inches thick; abrupt lower boundary.

C_{1g} 9 to 14 inches, dark grayish-brown (10YR 4/2) silt loam; many, medium, distinct mottles of dark yellowish brown (10YR 4/4); weak medium crumb structure; friable; pH 5.4 to 5.6; 4 to 6 inches thick; gradual lower boundary.

C_{2g} 14 to 28 inches, grayish-brown (10YR 5/2) silt loam; medium distinct mottles of dark brown (7.5YR 4/4); very weak medium subangular blocky to medium crumb structure; firm when moist and slightly plastic when wet; pH 5.4 to 5.6; 12 to 18 inches thick; gradual lower boundary.

C_3 28 to 40 inches, dark grayish-brown (10YR 4/2) silt loam; vertical grayish-brown (10YR 5/2) streaks along old root channels and worm burrows; structureless; slightly firm; pH 5.6 to 5.8.

Range in characteristics: The texture of the surface layer ranges from sandy loam to silt loam. The lighter textures are in sandy areas east of the Black River, and the silt loam is on the Tug Hill Plateau.

Relief: Flat to depressed.
Drainage: Poor to somewhat poor. Soils subject to periodic flooding. Permanent water table at depths of 12 to 30 inches.
Native vegetation: Elm, willow, alder, and whitecedar.

MAPPING UNIT

The following mapping unit is the only member of the Rumney series mapped in this county. The profile is the same as that described for the series.

Rumney silt loam, 0 to 2 percent slopes (RhA; Group 31).

Saco Series

The soils of the Saco series are very poorly drained. They have developed on recent silty alluvium that has accumulated in areas covered by slack water or in areas where the stream current is sluggish. The sediments were washed from upland soils formed on glacial till. In the part of the county near the Adirondacks, the till was derived mainly from gneiss. In the Tug Hill Plateau section, the till was derived mainly from sandstone. The soils occur along streams on the Tug Hill Plateau. They also occur along the Black River and along streams flowing into the Black River from the east.

These soils are in the same catena as the well drained Ondawa soils, the moderately well drained to somewhat poorly drained Podunk soils, and the poorly drained to somewhat poorly drained Rumney soils. They are in the Humic Gley great soil group.

Typical profile (Saco silt loam—undisturbed):

A_1 0 to 10 inches, very dark brown (10YR 2/2) silt loam; brown mottles along root channels; firm in place; moderate medium granular or crumb structure; pH 5.0 to 5.5; 8 to 12 inches thick; clear lower boundary.

CG 10 to 40 inches, gray (10YR 5/1) silt loam or silty clay loam; many medium to coarse mottles of brown and yellowish brown; firm to very firm in place; plastic and sticky when wet; massive; pH 5.4 to 5.6.

Range in characteristics: The color of the surface soil ranges from very dark brown to black. The texture ranges from silt loam to silty clay loam, but, generally, 1 to 3 feet of silt overlies the silty clay. The typical soil is strongly acid to medium acid. The pH is 6.0 or more in some areas along the west side of the Black River where the soil becomes saturated with water drained from limestone uplands.
Relief: Flat to depressed.
Drainage: Very poor. Subject to frequent flooding. Permanent water table at the surface or at depths of as much as 12 inches.
Native vegetation: Elm, willow, alder, and whitecedar, or swamp grasses and rushes.

MAPPING UNIT

The following mapping unit is the only member of the Saco series mapped in the county. Its profile is the same as that described for the series.

Saco silt loam, 0 to 2 percent slopes (SaA; Group 36).

Saugatuck Series

The soils of the Saugatuck series are poorly drained to somewhat poorly drained and have an ortstein. They have developed on deltaic or glaciolacustrine sands derived mainly from gneiss. The soils occur mainly east of the Black River.

These soils are in the same catena as the well drained Adams soils, the moderately well drained to somewhat poorly drained Croghan soils, and the very poorly drained Scarboro soils. All of these soils have formed on strongly acid sands of the Black River delta. The Saugatuck soils are in the Low-Humic Gley great soil group.

Typical profile (Saugatuck loamy fine sand—undisturbed):

A_0 3 to 0 inches, black, greasy mor under forest litter from hemlock, white pine, and gray birch; 2 to 4 inches thick; abrupt lower boundary.

A_2 0 to 3 inches, very pale brown (10YR 7/3) loamy fine sand; loose and friable; single grain; pH 5.0; 2 to 5 inches thick; abrupt lower boundary.

B_{21h} 3 to 4 inches, very dark grayish-brown (2.5Y 3/2) loamy fine sand to medium sand; weakly to strongly cemented; breaks to fragments or to peds that have medium to fine crumb structure; pH 4.5 to 4.8; 1 to 3 inches thick; clear lower boundary.

B_{22ir} 4 to 8 inches, medium to coarse sand, strongly cemented in places; horizontal streaks of dark reddish brown (2.5YR 2/4); large mottles of light grayish brown (10YR 6/2) and strong brown (7.5YR 5/8); breaks to large angular blocks that, in turn, break to single grain; blocks firm to hard; pH 4.8 to 5.0; 3 to 6 inches thick; gradual lower boundary.

B_{23} 8 to 24 inches, medium to coarse sand; many distinct, medium mottles of yellowish red (5YR 4/6 to 4/8) and strong brown (7.5YR 5/8); many pebble-sized iron concretions and discontinuous thin, cemented layers; pH 4.8 to 5.0; 12 to 18 inches thick; diffuse lower boundary.

C 24 to 40 inches, yellowish-brown (10YR 5/4) medium and fine sands with streaks of brown; loose and open; single grain; pH 5.0 to 5.2.

Range in characteristics: The texture of the surface soil ranges from loamy fine sand to loamy coarse sand. When cultivated, the upper horizons are mixed by plowing. The plow layer in cultivated areas is grayish brown and rests on the mottled, cemented B_{22ir} horizon. Cementation is not continuous and varies in degree. In some places the soil in the B_{22ir} horizon breaks out in large clods. In other places areas are included that have a subsoil of gray sand mottled with brown.
Relief: Flat to very gently rolling or slightly depressed; in many places, occurs as low areas between low ridges of Adams or Croghan soils.
Drainage: Surface runoff and internal drainage are slow. The natural water table is high, and in the driest parts of the summer it is at depths of 24 to 36 inches.
Native vegetation: Red spruce, balsam, white pine, and hemlock. Abandoned areas quickly revert to thickets of gray birch.

MAPPING UNIT

The following mapping unit is the only member of the Saugatuck series mapped in this county. It is similar to the typical soil described for the series.

Saugatuck loamy fine sand, 0 to 3 percent slopes (SbA; Group 21).

Scantic Series

The soils of the Scantic series are poorly drained to somewhat poorly drained and are medium acid. They have developed on glaciolacustrine silts and clays. The silts and clays were washed from acid upland soils formed from glacial till that was derived mainly from Adirondack gneiss.

These soils are in the same catena as the well drained Suffield soils, the moderately well drained to somewhat poorly drained Buxton soils, and the very poorly drained Biddeford soils. They are associated with Essex and Gloucester soils that occur on uplands and that have developed on glacial till. The soils of the Scantic series are in the Low-Humic Gley great soil group.

Typical profile (Scantic silty clay loam—cultivated):

- A_p 0 to 8 inches, dark grayish-brown (10YR 4/2) silty clay loam; moderate to strong medium to fine crumb structure; friable when moist and sticky and plastic when wet; pH 5.4 to 5.6; 7 to 9 inches thick; clear lower boundary.
- A_{2g} 8 to 14 inches, light brownish-gray (10YR 6/2) silty clay loam; strongly mottled; light brownish-gray coats cover the strong fine blocks that have interiors of olive brown (2.5Y 4/4); slightly firm when moist, hard when dry, and sticky and plastic when wet; pH 5.4 to 5.6; 5 to 7 inches thick; gradual lower boundary.
- $B_{21}G$ 14 to 25 inches, gray (10YR 5/1) silty clay loam; strong medium blocky structure; firm when moist and very firm when dry; blocks coated gray (10YR 5/1) to light brownish gray (10YR 6/2); interiors have prominent strong-brown (7.5YR 5/6 to 5/8) mottles; root channels are coated strong brown (7.5YR 5/6 to 5/8); sticky and plastic when wet; pH 5.6; 10 to 14 inches thick; gradual lower boundary.
- $B_{22}G$ 25 to 43 inches, gray (10YR 5/1) silty clay loam; many medium mottles of light gray (10YR 7/2), light brownish gray (10YR 6/2), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/8); moderate to strong fine blocky structure; firm when moist, very firm when dry, and sticky and plastic when wet; pH 5.8 to 6.0; 18 to 24 inches thick; clear lower boundary.
- B_{3g} 43 to 55 inches, grayish-brown (10YR 5/2) silty clay mottled pinkish gray (7.5YR 6/2) and brown (10YR 5/3); massive; very firm when moist; pH 5.8 to 6.0; 10 to 15 inches thick; gradual lower boundary.
- C 55 inches +, grayish-brown (10YR 5/2) to dark grayish-brown (10YR 4/2) silty clay; dense; varved; massive; brittle when removed and very firm; pH 7.0 to 7.2.

Range in characteristics: The texture of the surface layer ranges from silty clay loam to light silt loam, but in most of the soils the surface layer has a heavy texture. The color of the silty clay loam surface layer ranges from very dark gray to light gray. This soil is known locally as "gray clay land" or "white clay land."

Relief: Nearly level to very gently sloping; in places, slightly depressed.

Drainage: Poor. Surface runoff and internal drainage are very slow. In cultivated areas drainage has been improved by open ditches or by bedding.

Native vegetation: Elm, soft maple, hemlock, and white pine; some red spruce and balsam.

MAPPING UNITS

The following mapping units are in the Scantic series:

Scantic silty clay loam, 0 to 3 percent slopes (SdA; Group 30).

Scantic silt loam, 0 to 6 percent slopes (ScB; Group 19).—Except that this soil is lighter textured throughout, it is similar to the soil described for the series. It has a surface soil of silt loam, and the subsoil is silt loam or very fine sandy loam. The substratum is somewhat heavier textured than that of the typical profile.

Scarboro Series

The soils of the Scarboro series have very poor drainage, which is their dominant characteristic. They have developed on glaciofluvial or glaciolacustrine materials.

These soils belong to both the Adams and Colton catenas and have the poorest drainage of any of the soils of these catenas. They are in the Humic Gley great soil group.

Typical profile (Scarboro fine sandy loam—undisturbed):

- A_0 2 to 0 inches of forest litter over a thin mat of black, rootbound humus; pH 4.0 to 4.5; 1 to 3 inches thick; abrupt lower boundary.
- A_1 0 to 2 inches, very dark brown (10YR 2/2) to black (10YR 2/1) loam; high content of organic matter; mucky in places; weak fine crumb structure; pH 4.5 to 5.0; 2 to 4 inches thick; clear lower boundary.
- A_2G 2 to 6 inches, dark-gray (10YR 4/1) fine sandy loam; common medium mottles of brown or grayish brown; weak fine crumb structure; friable; pH 4.5 to 5.0; 3 to 5 inches thick; clear lower boundary.
- B_2G 6 to 12 inches, brown (10YR 5/3), yellowish-brown (10YR 5/4), and gray (10YR 5/1) fine sandy loam to loamy fine sand; strongly mottled; slightly firm in place but friable when crushed; pH 5.1 to 5.4; 5 to 10 inches thick; clear lower boundary.
- C 12 inches+, gray (10YR 5/1 to 5/2) fine sand or sand and gravel; single grain; slightly firm; pH 5.0 to 5.4; saturated with water for long periods.

Range in characteristics: The texture of the surface soil ranges from loam to loamy sand or gravelly loamy sand. Where the soil is associated with Colton soils, it is gravelly, and where it is associated with Adams soils it is nongravelly.

Relief: Flat to depressed.

Drainage: Very poor. There is no surface runoff, and internal drainage is very slow. The permanent water table is only 12 to 24 inches below the surface, even in the driest part of the year.

Native vegetation: Soft maple, elm, yellow birch, hemlock, and white pine.

MAPPING UNITS

The following mapping units are in the Scarboro series:

Scarboro fine sandy loam, 0 to 2 percent slopes (SeA; Group 22).

Scarboro loamy sand, neutral phase, 0 to 2 percent slopes (SfA; Group 22).—This soil occurs on the west side of the Black River. Its parent material was derived from the same source as that of the typical soil described for the series, but this soil is saturated with water that has drained from high-lime areas. This alkaline ground water gives the soil a neutral reaction.

Scituate Series

The soils of the Scituate series are moderately well drained to somewhat poorly drained and are strongly acid. They have developed on firm glacial till of Late Wisconsin age. The till was derived mainly from gneiss and granite.

These soils are in the same catena as the well-drained Essex soils, the poorly drained to somewhat poorly drained Ridgebury soils, and the very poorly drained Whitman soils. They are associated with all of these soils and also with the Gloucester soils. The Scituate soils are weak Podzols and have strong fragipans.

Typical profile (Scituate stony fine sandy loam—undisturbed):

- A_0 2 to 0 inches of forest litter over black, well-decomposed organic material bound together by fine roots; extremely acid; 1 to 3 inches thick; abrupt lower boundary.
- A_1 0 to 3 inches, dark grayish-brown (10YR 4/2) stony loam; weak to moderate fine crumb structure; friable; pH 4.8 to 5.2; 2 to 4 inches thick; clear lower boundary. (A faint, discontinuous light-gray A_2 horizon occurs in places.)
- B_{21} 3 to 13 inches, strong-brown (7.5YR 5/8) stony fine sandy loam; weak fine crumb structure; friable; pH 5.2 to 5.4; 8 to 12 inches thick; clear lower boundary.

B_{22} 13 to 18 inches, brown (7.5YR 5/4) stony fine sandy loam; weak fine crumb structure; very friable; faintly mottled in places; pH 5.4 to 5.6; 4 to 6 inches thick; clear lower boundary.

A'_2 18 to 22 inches, yellowish-brown (10YR 5/4) gritty fine sandy loam faintly mottled with brown; weak medium platy structure; firm; pH 5.4 to 5.6; 3 to 6 inches thick; gradual lower boundary.

B'_2 22 to 32 inches, grayish-brown (10YR 5/2) stony fine sandy loam; compact; moderate to strong medium platy structure; very firm when moist and hard when dry; many, medium, distinct mottles of brown (10YR 5/3) and strong brown (7.5YR 5/8) within very coarse prisms; prisms are 12 to 30 inches across and coated with gray (10YR 5/1); pH 5.2 to 5.6; 8 to 12 inches thick; gradual lower boundary.

C 32 inches+, grayish-brown (10YR 5/2 to 4/2) stony sandy loam till; compact; strong medium platy structure; firm when moist and hard when dry; little root penetration; pH 5.6 to 5.8.

Range in characteristics: In cultivated areas the surface layer has been mixed by plowing and the plow layer is grayish brown. The soils are stony or very stony. The degree of expression of the fragipan (A′ and B′ horizons) varies. Where the soil is associated with Gloucester soils, the fragipan is less pronounced than in the normal soil.

Relief: Undulating to rolling; slopes are dominantly 3 to 8 percent.

Drainage: Moderate. Surface runoff is medium and internal drainage is slow.

Native vegetation: Northern hardwoods, dominantly hard maple, beech, and yellow birch, but some hemlock, white pine, and whitecedar. There are thickets of gray birch on the idle areas.

MAPPING UNITS

The following mapping units are in the Scituate series:

Scituate stony fine sandy loam, 3 to 8 percent slopes (SgB; Group 10).

Scituate very stony fine sandy loam, 3 to 15 percent slopes (ShC; Group 38).—Except that this soil is covered with stones and boulders and has numerous rock outcrops, it is similar to the typical soil described for the series. Some of it is in forest, some is used as permanent pasture, and part is idle.

Sloan Series

The soils of the Sloan series are very poorly drained. They have formed in recent alluvium washed from calcareous glacial drift or from soils developed in glacial drift. They occur mainly on the west side of the Black River.

These soils are in the same catena as the well drained Genesee soils, the moderately well drained to somewhat poorly drained Eel soils, and the poorly drained to somewhat poorly drained Wayland soils. They are also in the same catena as the Chagrin and Lobdell soils. They are associated with other members of these catenas. The Sloan soils are similar to the Genesee and Eel soils but are more acid. They are in the Humic Gley great soil group.

Typical profile (Sloan silt loam—undisturbed):

A_1 0 to 10 inches, very dark gray (10YR 3/1) to black (10YR 3/1) silt loam; high content of organic matter; strong medium granular structure; pH 7.0 to 7.5; 8 to 10 inches thick; clear lower boundary.

G 10 to 30 inches, gray (N 5/0 to 10YR 5/1) silt loam; many medium, distinct and faint mottles of yellowish brow (10YR 5/2); weak coarse granular structure; slightly sticky and plastic when wet; pH 7.0 to 7.5; 18 to 24 inches thick; gradual lower boundary.

C 30 inches+, grayish-brown (10YR 5/2) to gray (10YR 5/1) silt loam mottled with yellowish brown; friable to slightly firm; pH 7.0 to 7.5.

Range in characteristics: The surface layer ranges in texture from silt loam to silty clay loam. It is black and mucky or very dark gray. The texture of the substratum varies. In some places it is sandy loam, and in others it is silty clay loam or is gravelly.

Relief: Flat to depressed.

Drainage: Very poor. The areas are flooded periodically, and the soil remains saturated for long periods. The natural water table is only 10 to 24 inches below the surface, even in the driest seasons.

Native vegetation: Elm, soft maple, alder, willow, and whitecedar; also cattails and rushes.

MAPPING UNIT

The following is the only member of the Sloan series mapped in this county:

Sloan silt loam, 0 to 2 percent slopes (SkA; Group 36).—This soil occurs on the west side of the Black River along streams that flow into the river. It is also on bottom lands where the ground water is charged with lime from the high-lime regions.

Suffield Series

The soils of the Suffield series are well drained. They have formed on glaciolacustrine silts and clays.

These soils are in the same catena as the moderately well drained to somewhat poorly drained Buxton soils, the poorly drained to somewhat poorly drained Scantic soils, and the very poorly drained Biddeford soils. They occupy a position in the catena similar to that occupied by the more sandy Hartland soils with which they are associated. The Suffield soils are grayer and are more acid than the Hudson soils, which also formed on glaciolacustrine silts and clays. They are weak Podzols.

Typical profile (Suffield silt loam—cultivated):

A_p 0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; strong medium to fine crumb structure; friable when moist and slightly sticky and plastic when wet; pH 5.6 to 5.8; 7 to 9 inches thick; clear lower boundary.

B_{21} 8 to 12 inches, strong-brown (7.5YR 5/6) silt loam; weak or very weak medium subangular blocky structure; breaks easily and then has a strong medium crumb structure; friable when moist and slightly sticky and plastic when wet; pH 5.6 to 5.8; 3 to 5 inches thick; gradual lower boundary.

B_{22} 12 to 26 inches, yellowish-brown (10YR 5/6) silt loam; weak medium subangular blocky structure, but aggregates break to medium crumb; friable when moist and moderately sticky and slightly plastic when wet; pH 5.6 to 5.8; 6 to 10 inches thick; gradual lower boundary.

C 26 inches+, grayish-brown (10YR 5/2) silt; massive to thick platy where there are varves of very fine sand; firm when moist and moderately sticky and slightly plastic when wet; pH 5.8 to 6.0.

Range in characteristics: Typically, the texture of the surface layer is silt loam, but in some included areas the texture is very fine sandy loam or silty clay loam. Where the texture of the surface soil is heavier, faint mottling occurs in places in the lower part of the B horizon. The pH is 6.0 at depths of 4 to 5 feet.

Relief: Undulating to gently rolling; slopes are dominantly 2 to 6 percent.

Drainage: Good. Surface runoff is medium to rapid, and internal drainage is medium.

Native vegetation: Northern hardwoods; hard maple and beech dominant, but some yellow birch, black cherry, basswood, and white ash.

MAPPING UNITS

The following mapping units are in the Suffield series:

Suffield silt loam, 0 to 2 percent slopes (SmA; Group 6).
Suffield silt loam, 2 to 6 percent slopes (SmB; Group 6).
Suffield and Hudson silt loams, 6 to 12 percent slopes (SnC; Group 17).—This mapping unit is made up of both Hudson and Suffield soils. The soils occupy stronger slopes than the typical soil described for their series. Except that the Suffield soil has a higher lime requirement, the soils are used and managed the same.

Swanton Series

The soils of the Swanton series are poorly drained to somewhat poorly drained. They have formed on deltaic and glaciolacustrine deposits that washed from soils derived mainly from gneiss and granite. The deposits consist of fine to medium sands, 18 to 30 inches thick, that overlie silt and clay. They occur only on the east side of the Black River.

These soils are in the same catena as the well drained Melrose soils, the moderately well drained to somewhat poorly drained Elmwood soils, and the very poorly drained Whately soils. They are associated with soils of the Suffield catena, which also formed on deltaic and glaciolacustrine deposits. The soils of the Swanton series are in the Low-Humic Gley great soil group.

Typical profile (Swanton fine sandy loam—pastured):

A_p 0 to 10 inches, very dark brown (10YR 2/2) or very dark grayish-brown (10YR 3/2) fine sandy loam to sandy loam; moderate medium crumb structure; friable; pH 6.0 to 7.0; 8 to 10 inches thick; clear lower boundary.

A_{2g} 10 to 15 inches, light brownish-gray (10YR 6/2) sandy loam; a few, fine, distinct mottles; very weak fine crumb structure or single grain; very friable; pH 6.5 to 7.0; 4 to 6 inches thick; clear lower boundary.

B_{2g} 15 to 25 inches, light brownish-gray (10YR 6/2) sandy loam; many, medium, distinct mottles of strong brown (7.5YR 5/8) and yellowish brown (10YR 5/4); single grain to very weak very fine crumb structure; very friable; pH 6.5 to 7.0; 8 to 12 inches thick; clear lower boundary.

D_1G 25 to 35 inches, gray (10YR 5/1) silt; common, medium, prominent mottles of strong brown (7.5YR 5/8) and fine mottles of pale brown (10YR 6/3); massive to thick platy structure; moderately sticky and plastic when wet; pH 6.5 to 7.2; 8 to 12 inches thick; gradual lower boundary.

D_2G 35 inches+, gray (10YR 5/1 to 5/0) and yellowish-brown (10YR 5/6) silt or silty clay mottled with vertical streaks of pale brown (10YR 6/3); dense; massive to thick platy structure; moderately sticky and plastic when wet; saturated for long periods; pH 6.8 to 7.2.

Range in characteristics: The texture of the surface soil ranges from fine sandy loam to coarse sandy loam. The depth to the underlying silt is generally 25 inches but ranges from 18 to 40 inches.

Relief: Nearly level to slightly depressed.

Drainage: Poor. Surface runoff is slow, and internal drainage is very slow.

Native vegetation: Hemlock, white pine, elm, and black ash.

MAPPING UNIT

The following is the only member of the Swanton series mapped in this county. Its profile is the same as that described for the series.

Swanton fine sandy loam, 0 to 2 percent slopes (SoA; Group 21).

Tughill Series

The soils of the Tughill series are very poorly drained. They occur in swales and depressions, and they formed in strongly acid, stony, sandy glacial till of Late Wisconsin age. The till was derived mainly from thin-bedded sandstone of the Oswego and Pulaski formations.

These soils belong to the Worth catena and occur in association with the Worth, Empeyville, and Westbury soils of that catena. They are in the Humic Gley great soil group.

Typical profile (Tughill stony silt loam—undisturbed):

A_0 6 to 0 inches, brownish, greasy mor made up of partly decomposed litter from red spruce and balsam that overlies black, well-decomposed organic material; weak medium granular structure; pH 3.8 to 4.0; 4 to 7 inches thick; abrupt lower boundary.

A_2G 0 to 3 inches, gray (2.5Y 5/1 to N 5/0) stony silt loam; moderate medium platy structure; slightly firm; nonsticky and nonplastic; up to 50 percent is coarse fragments of sandstone slabs; pH 4.6 to 4.8; 2 to 4 inches thick; clear lower boundary.

B_2G 3 to 18 inches, light olive-gray (5Y 6/2) to gray (5Y 6/1) sandy loam or fine sandy loam; many, medium, distinct mottles of olive brown (2.5Y 4/4); moderate medium platy structure; firm; up to 60 percent is coarse fragments of sandstone flags and slabs; pH 4.4 to 4.6; 12 to 18 inches thick; gradual lower boundary.

C_g 18 inches +, light olive-gray (5Y 6/2) stony sandy till; faint, olive-brown mottles; strong medium platy structure; firm to very firm; pH 4.6 to 4.8.

Range in characteristics: The parent material has a sandy texture, but the texture of the solum ranges from sandy loam to sandy clay loam. The mor humus layer is extremely acid, and the surface layer is very strongly acid. In many places where the soil was derived mainly from materials derived from Pulaski sandstone, the lower part of the profile and the substratum have a pH of 6.0 or more. In places, chiefly in the westernmost part of the county, the soil has formed from parent material that is pinkish in color. This color comes from the mixing of reddish Medina sandstone with Oswego sandstone in the underlying till.

Relief: Flat to depressed.

Drainage: Very poor. There is no surface runoff, and the areas receive seepage and runoff from adjacent soils. Internal drainage is very slow.

Native vegetation: Red spruce, balsam, larch, soft maple, alder, and willow.

MAPPING UNIT

The following is the only member of the Tughill series mapped in this county. Its profile is the same as that described for the series.

Tughill stony and very stony silt loams, 0 to 5 percent slopes (TaB; Group 39).

Turin Series

The soils of the Turin series are medium textured and are moderately well drained to somewhat poorly drained. They have formed from weakly to moderately calcareous glacial till of Late Wisconsin age. The till is made up of dark-colored shale and varying amounts of limestone, sandstone, and granite. The moderately dark color of the solum of these soils reflects the dark color of the shale.

These soils are in the same catena as the well-drained Poland soils, the poorly drained to somewhat poorly

drained Ilion soils, and the very poorly drained Fonda soils. In some places the soils are transitional to the Manheim soils, and in other places they are transitional to Camroden soils. They are more acid, less siliceous, and have a more strongly developed profile than the Manheim soils. They lack the fragipan and the Podzol upper solum of the Camroden soils. The Turin soils are Gray-Brown Podzols.

Typical profile (Turin silt loam—cultivated):

A_p 0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate to strong medium crumb structure when in sod; friable; pH 5.0 to 6.0 where unlimed; in forested areas the A_1 horizon is 2 to 4 inches thick; clear lower boundary.

A_{21} 8 to 13 inches, dark yellowish-brown (10YR 4/4 to 5/4) to brown (10YR 5/3) silt loam; in places common, faint, medium mottles; friable; pH 5.0 to 6.0; 3 to 7 inches thick; clear lower boundary.

A_{22g} 13 to 15 inches, grayish-brown (10YR 5/2) loam; many, medium, distinct, yellowish-brown mottles; weak thin platy to weak medium crumb structure; slightly firm to friable; pH 5.2 to 6.2; in places this horizon is discontinuous or is evident only because it has a slightly lower chroma and more distinct mottling than the lower part of horizon A_{21}; 0 to 4 inches thick; clear lower boundary.

B_{21g} 15 to 18 inches, heavy silt loam or light silty clay loam; moderate medium blocky structure; blocks thinly coated with grayish-brown (10YR 5/2) loam similar to material of the A_{22g} horizon; interiors dark grayish brown (10YR 4/2) with many, medium, distinct, yellowish-brown mottles; slightly firm; clayflow apparent inside the peds but not on ped faces; pH 5.4 to 6.5; 2 to 5 inches thick; gradual lower boundary.

B_{22g} 18 to 32 inches, silty clay loam; weak to moderate medium subangular blocky structure; blocks coated with dark-gray (10YR 4/1 to 3/1) silty clay; interiors dark grayish brown (10YR 4/2) to dark brown (10YR 3/3) with many, medium and fine, distinct, yellowish-brown and brown mottles; firm; clayflow prominent on faces and inside of peds; pH 5.8 to 7.0; 10 to 18 inches thick; gradual lower boundary.

B_{3g} 32 to 45 inches, dark grayish-brown (10YR 4/2 to 2.5Y 4/2) heavy silt loam or light silty clay loam; many, medium, distinct to faint, yellowish-brown mottles; weak to moderate medium and coarse blocky structure; firm; in places has weakly expressed fragipan; pH 6.5 to 7.5+; 8 to 18 inches thick; gradual lower boundary.

C 45 inches +, dark grayish-brown (2.5Y 4/2) silt loam; contains many dark-gray to black fragments of shale; mottled in places in the upper part; weak to moderate medium angular blocky structure, crudely arranged in plates; firm; calcareous.

Range in characteristics: The color values of the soil, when dry, are 1 to 2 units of value higher than the colors described, which are for moist soil. The color of the B horizon varies according to the amount of dark-colored shale in the parent material. They range from brown or dark brown to dark grayish brown. Generally, the lower horizons contain more dark material than the upper horizons. The depth to carbonates ranges from 3 to more than 4 feet. Typically, the clay content decreases at depths below 32 inches. In some places, however, where shale is concentrated in the underlying till, the silty clay loam continues into a C_1 horizon. Where the Turin soils are transitional to the Manheim soils, the soil is darker colored throughout, the texture of the upper part of the C horizon approaches silty clay loam, and the pH of the upper part of the solum is near 6.0. Where the soil is transitional to the Camroden soils, the A_{21} horizon of undisturbed soil is yellowish brown and the B_{3g} horizon approaches a weakly expressed fragipan.

Relief: Gently sloping to moderately steep; the slopes are uniform to convex and dominantly 3 to 8 percent.

Drainage: Moderately good to somewhat poor. Surface runoff is medium to rapid, and internal drainage is slow.

Native vegetation: Northern hardwoods; sugar maple is dominant.

MAPPING UNITS

The following mapping units are in the Turin series:

Turin silt loam, 0 to 3 percent slopes (TbA; Group 13).
Turin silt loam, 3 to 8 percent slopes (TbB; Group 7).
Turin silt loam, 8 to 15 percent slopes (TbC; Group 18).

Wallkill Series

The soils of the Wallkill series have formed in recent alluvium deposited over peat or muck. In most places they have formed through the action of natural soil-developing processes. In places, however, they are made up of silt that was dredged from the Black River and dumped on top of peat and muck. The soils occur only along the Black River. They are in the Humic Gley great soil group.

Typical profile (Wallkill silt loam—undisturbed):

0 to 10 inches, very dark gray (10YR 3/1) silt loam; high content of organic matter; strong medium granular structure; pH 5.4 to 5.6; 8 to 12 inches thick; clear lower boundary.

10 to 30 inches, very dark grayish-brown (10YR 3/2) silt loam or fine sandy loam; variable content of organic matter; moderate medium to fine crumb structure; pH 5.6 to 5.8; 18 to 24 inches thick; clear lower boundary.

30 inches +, very dark brown (10YR 2/2) partly decomposed fibrous peat or black granular muck; material varies from place to place; pH 5.5 to 6.0.

Range in characteristics: The depth of the silty materials ranges from 18 to 40 inches. In places the underlying organic material is brown peat or black, decomposed organic matter. In others it consists of peat or muck mixed with mineral sediments.

Relief: Flat to slightly depressed.

Drainage: Very poor. The water table is above or at the surface for long periods, but late in summer and in fall it drops to depths of as much as 18 inches below the surface.

Native vegetation: Cattails, rushes, and swamp grass.

MAPPING UNIT

The following is the only member of the Wallkill series mapped in this county:

Wallkill silt loam, 0 to 2 percent slopes (WaA; Group 36).

Walpole Series

The soils of the Walpole series are poorly drained. They have formed on sandy and gravelly outwash made up mainly of gneiss and granite.

These soils are in the same catena as the well drained Colton soils, the moderately well drained Duane soils, and the very poorly drained Scarboro soils. They are associated with the Gloucester, Essex, and Scituate soils, which are on uplands, and have formed from glacial till. These soils are also associated with the Adams, Croghan, and Saugatuck soils that have developed on gravel-free loamy sand. They are in the Low-Humic Gley great soil group.

Typical profile (Walpole loam—undisturbed):

A_0 3 to 0 inches of forest litter from deciduous trees and from white pines and hemlocks; the litter overlies black, well-decomposed, granular, organic material; pH 4.5 to 5.0; 2 to 4 inches thick; abrupt lower boundary.

A_1 0 to 4 inches, very dark grayish-brown (10YR 3/2) loam or fine sandy loam; weak fine crumb structure; very friable; pH 4.5 to 5.0; 3 to 5 inches thick; clear lower boundary.

$B_{21}G$ 4 to 14 inches, gray (10YR 5/1) fine sandy loam; many medium mottles of yellowish brown (10YR 5/6) and grayish brown (10YR 5/2); weak fine crumb structure; friable; pH 5.0 to 5.2; 8 to 12 inches thick; gradual lower boundary.

B_{22g} 14 to 28 inches, brown (10YR 5/3) sandy loam; contains fine gravel; many medium and fine mottles of yellowish brown and grayish brown; single grain; firm in place; pH 5.0 to 5.3; 12 to 18 inches thick; diffuse lower boundary.

C 28 inches+, light yellowish-brown (10YR 6/4) loose sand and gravel made up mainly of gneiss; pH 5.0 to 5.4.

Range in characteristics: The texture of the surface soil ranges from coarse sandy loam to loam. Although the color of this layer is normally dark gray to very dark grayish brown, some included areas have a light-gray surface soil. Gravel occurs only in places in the solum, but it is present in the substratum in all areas.

Relief: Nearly level to slightly depressed.

Drainage: Poor. Surface runoff is slow, and internal drainage is slow to very slow. In winter and spring the water table is at the surface; the permanent water table never drops below depths of 3 to 4 feet.

Native vegetation: Elm, red maple, alder, spruce, and balsam; in places, white pine and hemlock.

MAPPING UNIT

The following is the only member of the Walpole series mapped in this county:

Walpole loam, 0 to 4 percent slopes (WbA; Group 21).

Waumbek Series

The soils of the Waumbek series are moderately well drained to somewhat poorly drained. They have formed on glacial till of Late Wisconsin age. The till was derived mainly from Adirondack gneiss.

These soils were not mapped in detail. In the reconnaissance mapping of the forested eastern part of the county, they were included in several soil associations, which are described in the section, Soil Associations. They are the catenary associates of the well-drained Hermon soils, the poorly drained to somewhat poorly drained Ridgebury soils, and the very poorly drained Whitman soils. The Waumbek soils are Podzols.

Typical profile (Waumbek stony sandy loam—forested):

A_0 3 to 0 inches, litter from deciduous and coniferous trees, overlying black, well-decomposed, organic matter that has a greasy feel; pH 4.0 to 4.5; 2 to 4 inches thick.

A_2 0 to 2 inches, grayish-brown (10YR 5/2) stony loamy fine sand; loose; single grain; pH 4.0 to 4.5; 1 to 4 inches thick; abrupt lower boundary.

B_{21} 2 to 7 inches, strong-brown (7.5YR 5/6) loamy sand or fine sand; contains large and small stones; weak very fine crumb structure; slightly firm in place and very friable when removed; pH 4.5 to 5.0; 4 to 6 inches thick; clear lower boundary.

B_{22} 7 to 14 inches, light yellowish-brown (10YR 6/4) to yellowish-brown (10YR 5/4) loamy sand; contains small to large stones; very weak fine to medium crumb structure; slightly firm in place but friable when removed; pH 4.5 to 5.0; 6 to 8 inches thick; gradual lower boundary.

B_3 14 to 24 inches, pale-brown (10YR 6/3) loamy sand; common medium mottles of strong brown and yellowish brown; many large to small stones and pebbles of gneiss; firm in place; single grained when removed; pH 4.5 to 5.0; 8 to 12 inches thick; diffuse lower boundary.

C 24 inches+, pale-brown (10YR 6/3) coarse sandy till; many large to small stones of Adirondack gneiss; common faint mottles of yellowish brown and grayish brown; single grain; firm in place and friable when removed; in places, has a weak medium platy structure; pH 4.5 to 5.0.

Range in characteristics: The depth of the solum is generally 24 inches, but it ranges from 18 to 30 inches. The soils are stony, and in places they are extremely stony. The parent material varies. It is loose where the soils are associated with the Hermon soils and compact and platy where they are associated with the Becket soils. The areas adjacent to the Becket soils consist of Skerry soils but have been mapped with the Waumbek soils. The Skerry soils were not mapped separately in this county. Except that they have a fragipan, they are similar to the Waumbek soils.

Relief: Gentle to moderate.

Drainage: Moderate to poor. Surface runoff is medium and internal drainage is slow. The soil in places receives seepage from higher lying areas.

Native vegetation: White pine, hemlock, hard maple, beech, and yellow birch.

Wayland Series

The soils of the Wayland series are poorly drained to somewhat poorly drained. They have formed in recent alluvium washed from high-lime soils of the uplands. They occur mainly along the west side of the Black River.

The Wayland soils occupy the poorly drained positions in both the Genesee and Chagrin catenas, and the Sloan soils are their very poorly drained associates. The Wayland soils are in the Low-Humic Gley great soil group.

Typical profile (Wayland silt loam—cultivated):

A_1 0 to 10 inches, very dark grayish-brown (10YR 3/2) silt loam; strong-brown mottles along root channels; strong medium crumb or granular structure; friable when moist and slightly sticky and plastic when wet; pH 6.6 to 7.2; 8 to 11 inches thick; clear lower boundary.

C_1G 10 to 30 inches, light brownish-gray (10YR 6/2) to gray (10 YR 5/1) silt loam; many medium mottles of strong brown and yellowish brown; weak fine to medium crumb structure; friable; pH 6.8 to 7.2; 18 to 24 inches thick; diffuse lower boundary.

C_2 30 inches+, light brownish-gray (10YR 6/2) silt loam; faint yellowish-brown mottles; structureless; slightly firm; pH 6.8 to 7.5.

Range in characteristics: The surface soil ranges from silt loam to silty clay loam in texture. Its color ranges from very dark grayish brown to very dark gray. In Lewis County most of this soil has formed in alluvial deposits that have washed from acid upland areas. The reaction of the soil is neutral, however, because it is saturated with water from streams that flow out of the high-lime areas between the Tug Hill Plateau and the Black River.

Relief: Flat bottom lands along streams.
Drainage: Poor. Surface runoff and internal drainage are slow to very slow.
Native vegetation: Elm, red maple, willow, and alder.

MAPPING UNIT

The following is the only member of the Wayland series mapped in this county:

Wayland silt loam, 0 to 2 percent slopes (WcA; Group 31).

Westbury Series

The soils of the Westbury series are poorly drained to somewhat poorly drained. They have formed on glacial till of Late Wisconsin age. The till was derived mainly from Oswego and Pulaski sandstones but includes a small amount of shale.

These soils are in the same catena as the well drained Worth soils, the moderately well drained to somewhat poorly drained Empeyville soils, and the very poorly drained Tughill soils. They occur in association with those soils. They are in the Low-Humic Gley great soil group.

Typical profile (Westbury stony loam—undisturbed):

A_0 6 to 0 inches of forest litter from deciduous and coniferous trees over a black root mor; pH 3.8 to 4.0; 4 to 6 inches thick.

A_2 0 to 2 inches, pinkish-gray (7.5YR 6/2) stony loam; weak fine crumb structure; very friable; pH 3.8 to 4.0; 1 to 3 inches thick; abrupt lower boundary.

B_{21} 2 to 6 inches, strong-brown (7.5YR 5/8) stony light silt loam or stony loam; fragments have weak medium subangular blocky structure but break easily to weak fine crumbs; friable to very friable; 35 percent consists of coarse stone fragments; pH 4.2 to 4.4; 3 to 6 inches thick; clear lower boundary.

B_{22g} 6 to 10 inches, pale-brown (10YR 6/3) stony loam to stony silt loam; common, medium, distinct mottles of strong brown and yellowish brown; fragments have weak medium subangular blocky structure but break easily to weak fine crumbs; old root channels or worm burrows filled with black, highly organic silt; 35 percent of layer consists of coarse sandstone fragments; pH 4.4 to 4.6; 5 to 8 inches thick; gradual lower boundary.

B_{3g} 10 to 20 inches, light yellowish-brown (10YR 6/4) fine sandy loam; many fine and medium, distinct to prominent mottles of yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8); weak thick platy structure that breaks to fine platy; firm and compact; has up to 40 percent of coarse sandstone fragments and flags; pH 4.6 to 5.0; 8 to 12 inches thick; diffuse lower boundary.

C 20 inches+, light brownish-gray (10YR 6/4) to pale-brown (10YR 6/3) stony loam till derived mainly from sandstone; strong medium to thick platy structure; compact; pH 5.0 to 6.0.

Range in characteristics: Where the upper horizons have been mixed by plowing, the surface layer is grayish brown and overlies a brown upper subsoil. The texture of the surface soil ranges from loam to very fine sandy loam and is stony or very stony. In some places in the western part of the county, the parent material is pinkish. The pinkish color comes from the reddish sandstone that is in the underlying till.
Relief: Nearly level to gently sloping.
Drainage: Poor to somewhat poor. Surface runoff is slow, and internal drainage is slow to very slow. Drainage is restricted by the compact subsoil and substratum.
Native vegetation: Red maple, elm, red spruce, balsam, willow, and a er.

MAPPING UNITS

The following mapping units are in the Westbury series:

Westbury stony loam, 0 to 3 percent slopes (WdA; Group 20).
Westbury stony loam, 3 to 8 percent slopes (WdB; Group 19).
Westbury very stony loam, 0 to 8 percent slopes (WeB; Group 39).—This soil is covered with flags and slabs of sandstone. Much of it has been cleared, but it has never been plowed. It is in forest, is used for permanent pasture, or is idle.

Westland Series

The soils of the Westland series are very poorly drained. They have formed on outwash and on alluvial fan materials. These materials were derived mainly from shale but include some limestone and sandstone. The soils occur on stream terraces or are at the bases of alluvial fans.

These soils are in the same catena as the well drained Herkimer soils, the somewhat poorly drained to moderately well drained Houseville soils, and the poorly drained Glenfield soils. They are also in the same catena as the Howard soils and are associated with those soils. The Westland soils are in the Humic Gley great soil group.

Typical profile (Westland silt loam—undisturbed):

A_{00} Forest litter from deciduous and whitecedar trees.

A_1 0 to 4 inches, very dark grayish-brown (10YR 3/2) silt loam high in organic matter; strong medium granular or crumb structure; pH 6.5 to 7.0; 4 to 10 inches thick; gradual lower boundary.

A_{12} 4 to 11 inches, dark grayish-brown (10YR 4/2) silt loam mottled with yellowish brown; weak medium subangular blocky structure; contains many shale fragments and some fine gravel; pH 6.5 to 7.0; 0 to 8 inches thick; gradual lower boundary.

G 11 to 30 inches, dark-gray (10YR 4/1) silt loam to silty clay loam; many, medium and fine mottles of light yellowish brown, grayish brown, and strong brown; moderate subangular blocky structure; some soft fragments of dark shale and gravel in lower part; pH 6.8 to 7.2; 18 to 24 inches thick; diffuse lower boundary.

C 30 inches+, dark-gray (10YR 4/1) silty clay loam mottled with brown and grayish brown; massive to weak blocky structure; many soft, partly decomposed fragments of dark shale; pH 7.0 to 7.5.

Range in characteristics: The content of organic matter in the upper horizons and the thickness of these horizons vary. In some places there is a mucky surface layer. The substratum in places is gravelly or shaly, and in other places the gravel and shale are absent.
Relief: Flat to depressed.
Drainage: Very poor. There is no surface runoff, and internal drainage is very slow.
Native vegetation: Elm, red maple, whitecedar, and swamp vegetation.

MAPPING UNIT

The following is the only member of the Westland series mapped in this county:

Westland silt loam, 0 to 2 percent slopes (WfA; Group 33).

Whately Series

The soils of the Whately series are very poorly drained. They have formed on deltaic or glaciolacustrine deposits consisting of medium to fine sands that overlie silt and clay.

These soils are in the same catena as the well drained Melrose soils, the moderately well drained to somewhat poorly drained Elmwood soils, and the poorly drained to somewhat poorly drained Swanton soils. They are asso-

ciated with these soils and with the members of the Hartland and Suffield catenas. They have developed in sands that are similar to those in which the Adams and Croghan soils have developed. The silt and clay that underlie the Whately soils are similar to the material underlying the Suffield, Buxton, and Scantic soils. The Whately soils are in the Humic Gley great soil group.

Typical profile (Whately fine sandy loam—pastured):

A_p 0 to 10 inches, very dark gray (10YR 3/1) to black (10YR 2/1) sandy loam to fine sandy loam; in some places resembles sandy muck; moderate medium to coarse crumb structure; pH 6.1 to 6.5; 8 to 12 inches thick; abrupt lower boundary.

BG 10 to 24 inches, gray (10YR 5/1) to dark-gray (10YR 4/1) sandy loam; a few, medium, distinct mottles of grayish brown and brown; weak fine crumb structure; friable; pH 6.5 to 7.0; 12 to 15 inches thick; clear lower boundary.

D 24 inches+, grayish-brown (10YR 5/2) silt; common, medium, faint to distinct mottles of grayish brown and brown; massive; firm to very firm; pH 6.5 to 7.0.

Range in characteristics: The texture of the surface soil ranges from fine sandy loam to medium or coarse sandy loam. Typically, the depth to the underlying silt is 24 inches, but it ranges from 18 to 36 inches. Where the soil is associated with Gloucester and Essex soils, in places stones and gravel are scattered over the surface and mixed through the upper layers.

Relief: Flat to depressed.

Drainage: Very poor. There is no surface runoff, and internal drainage is very slow.

Vegetation: Elm, whitecedar, and alder; also cattails, sedges, and rushes.

MAPPING UNIT

The following is the only member of the Whately series mapped in the county:

Whately fine sandy loam, 0 to 2 percent slopes (WgA; Group 22).—This soil is used for permanent pasture or is idle.

Whitman Series

The soils of the Whitman series are very poorly drained. They have formed on glacial till derived mainly from gneiss. The soils occur in depressions and in other low areas.

These soils are the very poorly drained members of the Gloucester and Essex catenas, the soils of which are weak Podzols. They are also in the Becket and Hermon catenas, the soils of which are strong Podzols. The Whitman soils are in the Humic Gley great soil group.

Typical profile (Whitman stony loam—undisturbed):

A_0 6 to 0 inches, black, mucky, well-decomposed organic matter that contains many roots; pH 4.3 to 4.6; 4 to 7 inches thick; clear lower boundary.

A_2G 0 to 8 inches, gray (10YR 5/1) to grayish-brown (10YR 5/2) stony loam; a few, medium, distinct mottles of yellowish brown; very weak medium blocky to weak fine crumb structure; friable; pH 4.6; 6 to 10 inches thick; gradual lower boundary.

B_2G 8 to 18 inches, light brownish-gray (10YR 6/2) to light-gray (10YR 6/1) stony loam; common, medium, distinct mottles of yellowish brown and pale brown; weak thick platy structure; firm and compact in place; pH 5.0 to 5.2; 8 to 12 inches thick; diffuse lower boundary.

C_g 18 inches+, grayish-brown (2.5Y 5/2) till of stony sandy loam; common distinct mottles in the upper part; weak thick platy structure; firm and compact; pH 5.0 to 5.2.

Range in characteristics: The texture of the surface soil ranges from coarse sandy loam to loam, and the soil is stony to extremely stony.

Relief: Flat to depressed; in places occurs as seepy areas on gentle to moderate slopes.

Drainage: Very poor. Receives runoff and seepage from adjacent higher areas; internal drainage is very slow.

Native vegetation: Red maple, elm, red spruce, and balsam.

MAPPING UNIT

The following is the only member of the Whitman series mapped in this county:

Whitman soils, extremely stony, 0 to 8 percent slopes (WhB; Group 43).—This soil is made up of areas too stony to differentiate in detail.

Worth Series

The soils of the Worth series are well drained. They have formed in glacial till of Late Wisconsin age. The till consists mainly of sandstone. Most of these soils occur on till plains, but some are on drumlins, end moraines or marginal moraines.

The Podzol solum is moderately expressed in these soils. A slightly lighter colored, distinctly platy horizon (A'_2) separates the Podzol solum from compact layers (B'_{21M} and B'_{22} horizons), which are the fragipan. The fragipan contains little more clay than the Podzol solum and has a very weak structure. It is firm to very firm when moist and hard when dry. The fragipan occurs at depths of 18 to 27 inches and is 1 to 4 feet thick.

The Worth soils are in the same catena as the moderately well drained to somewhat poorly drained Empeyville soils, the poorly drained to somewhat poorly drained Westbury soils, and the very poorly drained Tughill soils. They are Podzols.

Typical profile (Worth stony loam—forested):

A_0 3 to 0 inches, nearly black mor humus; 1 to 4 inches thick.

A_2 0 to 2 inches, pinkish-gray (7.5YR 7/2) stony loam; very weak fine crumb structure; loose to very friable; pH 4.5; 1 to 4 inches thick; abrupt lower boundary.

B_{21} 2 to 10 inches, strong-brown (7.5YR 5/6 to 10YR 5/6) stony loam; very weak very fine crumb structure; very friable; pH 4.5 to 5.0; in places the upper 1 to 3 inches is darkened by organic matter to form a B_{2h} horizon of dark reddish brown (5YR 2/2); 6 to 10 inches thick; clear lower boundary.

B_{22} 10 to 17 inches, yellowish-brown (10YR 5/4) stony loam or fine sandy loam; very weak very fine crumb structure; very friable; pH 4.5 to 5.0; 6 to 10 inches thick; clear lower boundary.

B_{23} 17 to 21 inches, dark yellowish-brown (10YR 4/4) stony fine sandy loam; weak fine crumb structure; very friable; pH 5.0; 2 to 5 inches thick; clear lower boundary.

A'_2 21 to 25 inches, pale-brown to brown (10YR 6/3 to 5/3) stony fine sandy loam; weak thin and medium platy structure or structureless; friable to firm; pH 4.5 to 5.0; 3 to 7 inches thick; in places not distinguishable from moist B_{23} horizon; in places faces of plates weakly mottled with yellowish brown; gradual lower boundary.

B'_{21M} 25 to 38 inches, brown (7.5YR 5/4 to 10YR 5/3) stony fine sandy loam; has slightly more clay than A'_2 horizon; weak very coarse prismatic structure; prisms are 1 to 3 feet across and have very thin coats of light yellowish-brown (10YR 6/4) very fine sand; interiors of prisms range from essentially structureless to very weak medium angular blocky

structure; the blocks have no apparent coatings, but under magnification the pores show very thin linings of fine sandy or silty material; stones have 1/16- to 1/4-inch deposits on tops and sides; pH near 5.0; 10 to 20 inches thick; gradual lower boundary.

B'_{22} 38 to 55 inches, brown (10YR 5/3 to 6/3) stony fine sandy loam; has slightly less clay than horizon immediately above; massive to very weak angular blocky structure; very firm in the upper part but firm at greater depths; the very thin silty or very fine sandy linings in pores and the deposits on stones decrease with depth; pH near 5.0; 12 to 30 inches thick; diffuse lower boundary.

C_1 55 to 70 inches+, brown to pale-brown (10YR 5/3 to 6/3) very gravelly or stony loamy fine sand or light fine sandy loam; weak medium crumb structure to single grain; slightly firm to very friable; pH 5.0 to 5.5 in most places, but in some places pH is 6.5; pH increases slowly with depth; in some places calcareous below depths of 8 or 10 feet.

Range in characteristics: The surface texture ranges from sandy loam to loam, and stoniness ranges from very stony or flaggy to gravelly. The color values of the soils when dry are about 1 unit higher than those given, which are for moist soil.

The texture of the fragipan (B'_{21M} and B'_{22} layers) ranges from sandy loam to heavy loam. In most of the sandy soil, the structure of the fragipan is very weak or the soil is structureless. In the loamy soils, the fragipan has a weak blocky structure. The thickness of the fragipan ranges from 15 inches to 4 feet. In the areas where it is only 15 inches thick, the material is moderately firm. Where the fragipan is as much as 4 feet thick, the uppermost 12 to 15 inches is very firm and the rest of the material is transitional to the friable C_1 horizon. As the content of moisture increases, the fragipan becomes less firm.

Where red sandstone is an important constituent of the till, the C_1 horizon is colored 7.5YR or 5YR hues. The C_1 is extremely stony.

Relief: Dominantly undulating but in places hilly or steep. In places occurs on drumlins, end moraines, or marginal moraines that have complex slopes; the slopes are mainly convex, but where the soil occurs near Empeyville or Westbury soils the slopes are uniform or concave.

Drainage: Good. Surface runoff is medium to very rapid, and internal drainage is medium to slow.

Native vegetation: Northern hardwoods, mainly sugar maple and beech, but in places white pine or hemlock.

MAPPING UNITS

The following mapping units are in the Worth series:

Worth stony loam, 3 to 8 percent slopes (WmB; Group 5).

Worth stony loam, 8 to 15 percent slopes (WmC; Group 16).

Worth stony loam, 15 to 25 percent slopes (WmD; Group 28).

Worth flaggy silt loam, 3 to 8 percent slopes (WkB; Group 5).—This soil has formed from parent material that is mainly shale. It has more silt throughout, it is somewhat less stony, and the fragipan is not quite so pronounced as in the typical soil described for the series. It occurs between Pinckney and Camroden soils on the outer edges of the Tug Hill Plateau and the stony Worth soils and associated soils on the interior of the plateau. The soil is used and managed the same as the typical soil.

Worth flaggy silt loam, 8 to 15 percent slopes (WkC; Group 16).

Worth very stony loam, 3 to 15 percent slopes (WnC; Group 38).—This soil is made up of 50 to 60 percent of stones. The surface is covered with sandstone slabs and flags. Cleared areas are too stony for crops, but they can be used for permanent pasture.

Worth very stony loam, 15 to 35 percent slopes (WnD; Group 41).

General Nature of the Area

In this section the physiography of the county is described and the relation of geology to the soils is discussed. In addition, some statistics about agriculture are given as well as facts about the climate, water supply, and use of the area for wildlife and recreation.

Physiography, Relief, and Drainage

Lewis County is bordered on the north by the St. Lawrence Valley and on the south by the Mohawk Valley. The area east of the Black River is in the Adirondack province, and the area west of the river is part of the Tug Hill Plateau (*5*).

The Black River runs northwest along the nearly straight southwestern edge of the Adirondack province. It descends from elevations of 1,200 feet to 700 feet above sea level. To the east of the river, the valley slopes upward to the northeast across the plains of clay and sand of ancient glacial lakes to the foothills of the Adirondack Mountains. These foothills are low ridges of crystalline rock that extend in a general east-west direction. Their elevation is about 1,000 to 1,700 feet above sea level. This section is still under forest consisting mainly of second- and third-growth trees.

To the west of the Black River, the valley slopes upward to the southwest across a series of nearly level limestone terraces to a main escarpment 4 to 6 miles from the river. The escarpment is very steep and is 500 feet high. The terraces are covered by only a thin layer of glacial drift and were probably formed during the glacial period through ice erosion of the relatively soft limestone bedrock (*7*).

The Tug Hill Plateau rises gradually above the main escarpment across beds of sandstone and shale to a maximum elevation of 2,012 feet at Welch Hill, 3 miles northwest of Turin. From this high point the elevation of the plateau declines toward both the northern and southern ends. The interior of the plateau has been smoothed by glaciers. Here, the relief is low and drainage is poor. Many of the streams have no flood plains or only minor ones. All of the flats and depressions are swampy. This highland area, a remnant of the old Cretaceous peneplain, is capped by Oswego sandstone, which is buried under variable thicknesses of glacial drift. Only the outer edges of the plateau have been cleared and cultivated; the interior is still a heavily forested wilderness. Many of the areas once cultivated have been abandoned and are now reverting to forest or are being reforested by the State.

Nearly all of the areas used for agriculture are in the central valley of the Black River. They extend from the base of the main Tug Hill escarpment eastward to the Adirondack foothills. The flat limestone terraces west of the river merge at the base of Tug Hill proper into alluvial fans. These alluvial fans were built up at the base of this steep front by small streams that issued from the plateau. The fans, which consist chiefly of materials derived from shale, coalesce at the base of the hill to form an almost continuous belt, 1/4 to 1 mile wide. It extends from the southern boundary of the county to Harrisburg, a distance of about 28 miles. The most productive soils in the county are on these fans and on the glacial drift that covers the limestone terraces.

The central part of the valley east of the Black River is made up of nearly level areas backed by flat-topped deltas. On the east the deltas terminate in irregular moraines, or roundish hills, and elongated ridges with rock cores. The nearly level areas are silty and are covered with lake sediments. The deltas are sandy and gravelly, but in many places there are rounded outcrops that consist mainly of gneiss and granite. In some places, particularly north of Croghan, so many outcrops occur that the areas are known as "rockland." The materials from which the soils in the eastern part of the valley have developed were derived entirely from crystalline rocks. Except where the parent materials consisted of silty lacustrine deposits, the soils are coarse textured, droughty, and very strongly acid.

Lewis County is in three drainage basins—the Ontario, the St. Lawrence, and the Mohawk. More than two-thirds of the county is drained by the Black River and its principal tributaries. Runoff water from this part of the county flows to Lake Ontario near Watertown in Jefferson County. The Indian River and the West and Middle Branches of the Oswegatchie River drain the northeastern corner of the county, the former flowing to Lake Ontario and the latter to the St. Lawrence River. A few square miles in the town of Lewis in the southwestern part of the county drain to the Mohawk through the East Branch of the Mohawk River.

Geology in Relation to the Soils

Nearly all of the parent materials of the soils of Lewis County were deposited either directly or indirectly through glaciation. Only the recent alluvium of the flood plains and the alluvial fans at the base of the Tug Hill escarpment is postglacial.

Many thousands of years ago the climate was much colder than it is now. All of the snow that fell in winter did not melt in summer. Snow slowly accumulated and hardened into ice that became thousands of feet thick in parts of Canada north of New York. Because of the enormous weight of this mass of ice, the edges were forced outward until a great sheet of ice covered all of Lewis County.

As the ice moved over the land, it pulled fresh rock from the underlying formations, ground it into rock flour, and mixed it with the soil. This mixture was moved with the glacier and deposited at the places where the ice melted. Such material is made up of a heterogeneous mass of boulders, cobbles, gravel, sand, silt, and clay and is called glacial till. It varies in composition according to the rocks from which it was derived, and it occupies broad areas somewhat related to the bedrock of the county. Variations in composition of the till are reflected in the contrasting soils that developed on it.

The Black River divides the county into two soil regions. The soils of each region differ greatly in characteristics because of the highly contrasting bedrock of the two areas. East of the river, the bedrock is made up of very old, pre-Cambrian metamorphic and igneous materials. West of the river the bedrock consists of Ordovician sediments made up of a series of beds of limestone, black shale, gray shale, and sandstone. The beds occur in belts extending from the Black River to the Tug Hill Plateau. The names of these belts and the order in which they occur are shown in figure 3.

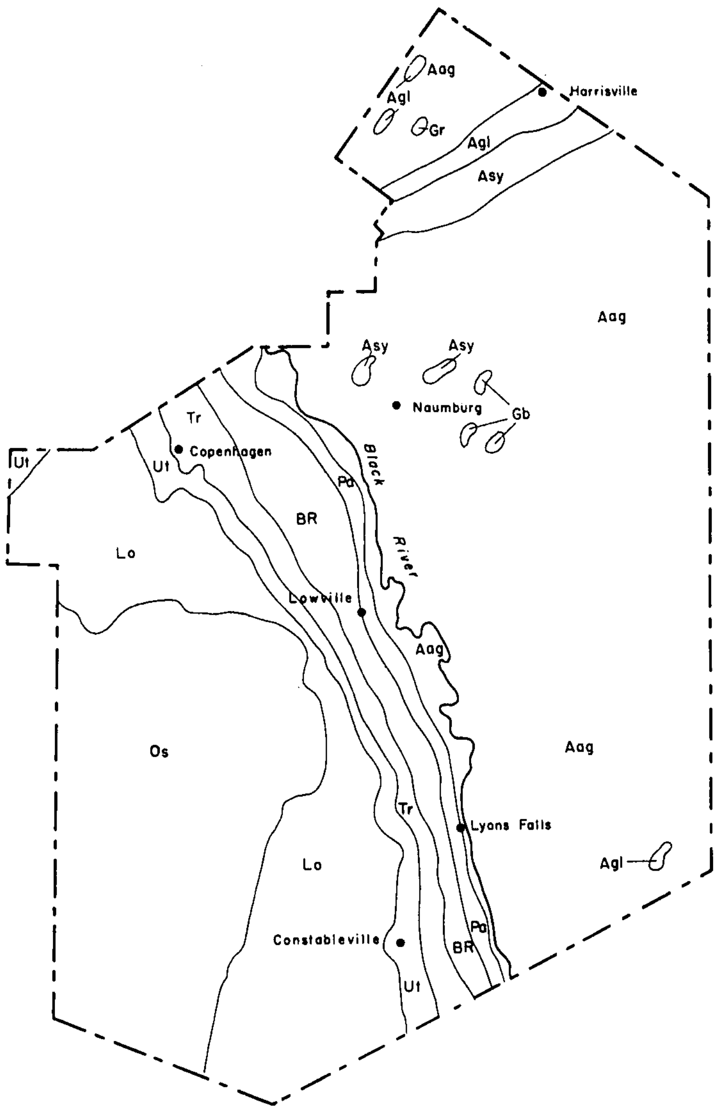

Figure 3.—**Bedrock geology of Lewis County, N. Y.**

Ordovician

Sedimentary rocks:
- **Os—Oswego sandstone**
- **Lo—Lorraine, sandstones and shales**
- **Ut—Utica shale**
- **Tr—Trenton limestone**
- **BR—Black River limestone**
- **Pa—Pamelia limestone**

Pre-Cambrian

Metamorphic rocks:
- **Agl—Grenville limestone**
- **Aag—Adirondack gneiss**

Igneous rocks:
- **Gb—Gabbro**
- **Asy—Augite-syenite**
- **Gr—Granite**

East of the river, Adirondack gneiss is the most extensive bedrock material, but other materials have caused differences among the soils. In places, particularly in the northern part of this area, crystalline limestone is interspersed with the gneiss. This is Grenville limestone, one of the oldest rocks in North America (*2*, *10*). The Dover and Bonaparte soils have formed in these areas, the Dover soils on glacial till and the Bonaparte on glacial outwash.

In other areas east of the river, the soils were formed from materials derived mainly from gneiss and granite. These soils are predominantly light textured, stony,

droughty, and strongly acid whether they have formed on glacial till or on outwash deposits.

Beginning on the west side of the Black River and extending westward are a series of limestone formations. The first is the Pamelia, which is about 72 feet thick and is made up of solidified lime muds. At Lowville this is overlain to a depth of 38 feet by Lowville limestone, a thick- to thin-bedded limestone that weathers to an ash-gray color. Overlying the Lowville formation is the Leray, a cherty limestone formation 15 to 20 feet thick. Above this and at the top of the first rock terrace is Watertown limestone. This is a thick-bedded, blocky, hard, dark bluish-gray or black limestone, 10 to 15 feet thick. The Lowville, Leray, and Watertown formations, collectively, are known as the Black River Beds (*2*).

Next in order are the Trenton beds, which overlie the Watertown formation. Near Martinsburg, these beds are more than 400 feet thick. They are made up of thin layers of limestone alternating with calcareous, shaly layers that make them less resistant than the underlying Watertown rocks. Between the Trenton and Utica formations are shaly limestone passage beds, 100 feet thick, known as the Cobourg formation.

The limestone beds have an aggregate thickness of several hundred feet. They have furnished the dominant rock material of the glacial deposits in the central valley, west of the Black River. The till that overlies the limestone bedrock is high in lime and is thick in places, but in many places it is relatively thin or is absent. The Nellis and associated soils that have developed in the till are among the most productive in the county.

Continuing westward, the underlying formation is made up of black, mildly calcareous shale. The shale ranges in thickness from 300 feet at the Oneida County line to only 45 feet along the Deer River at Copenhagen. This black shale is of post-Utica formation (*9*). Its influence on the characteristics of the soils is essentially the same as that of the typical Utica shale in the Mohawk Valley from which the Mohawk, Herkimer, Poland, and associated soils have formed. The shale is exposed at the base of a steep escarpment from Lowville to the southern boundary of the county. Its influence is confined mainly to the soils formed on the alluvial fans built up by streams cutting through the shale. At the northern end of the Tug Hill Plateau, however, the advancing ice crossed the shale at right angles, and here the shale has spread its influence over larger areas and affected the soils formed on till. In these areas most of the Mohawk and Poland soils occur.

Farther west, the bedrock is dominated by the Lorraine group that is many hundreds of feet thick. The lower part of this group consists of gray, acid shale and thin-bedded sandstone—the Whetstone Gulf formation; the upper part is made up of gray, acid shale and thick-bedded, generally slightly calcareous sandstone—the Pulaski formation (*9*). The glacial till around the outer edge of the Tug Hill Plateau was derived mainly from these rocks and gives rise to the Pinckney, Camroden, and Marcy soils. In the transitional zone between these rocks and the black calcarous shale are soils of the Poland catena.

In the westernmost part of the county, gray Oswego sandstone caps the Tug Hill Plateau. The soils on the interior of the plateau have formed in glacial drift from this rock. These soils are the stony to extremely stony soils of the Worth catena. The flaggy soils of the Worth catena occur in a belt along the eastern side of the main Worth catena in an area that is transitional between typical Worth and typical Pinckney soils.

The effects of glaciation did not stop with the deposition of glacial till. As the glacier melted, the higher areas were freed of ice, although ice persisted in the valleys. A lobe of ice remained in the valley of the Black River after the ice had melted from the Tug Hill Plateau. As the ice in the valley melted, volumes of water poured outward from the ice front and carried large amounts of suspended rock material. Where the streams flowed to the south, away from the ice, this coarse material was rolled along, rounded, and then dropped. These layered deposits of coarse sand and gravel are called glacial outwash. A few such deposits occur in Lewis County. The largest of these are along the east branch of Fish Creek and the Salmon River in the southwestern part of the county. The soils developed in these deposits are in the Colosse series.

Where the streams flowed northward, the divides on the south formed a dam to southward-flowing waters, and the ice front itself was a dam on the north. Lakes formed between these obstructions. A classic example of such a temporary glacial lake was that formed in the valley of the Black River (*4*). The first outlet of this lake was past Remsen in Oneida County. As the ice front receded, the waters found a lower outlet through the Lansing Kill southwest of Boonville, also in Oneida County. The next outlet was around the north end of Tug Hill. The Port Leyden Lake stage, with the outlet at Boonville, had the longest duration (*4*). Into this glacial lake the rivers that flowed out of the Adirondacks dumped quantities of sand to form the great delta east of the Black River. Sand and gravel were dropped near the shore. Silt and clay stayed in suspension longer and were deposited in deeper water as lake-laid silty material.

The soils formed on the sandy and gravelly deposits of the delta are members of the Colton and Adams catenas. The soils that formed on the silty and clayey lake-laid sediments are members of the Hudson, Suffield, and Hartland catenas. Some of these occur in the vicinity of Naumburg.

The alluvial soils that occur on the flood plains of the larger streams are forming in sediments laid down during flood periods. The alluvial fans built up at the base of the Tug Hill Plateau are made up of somewhat older postglacial materials deposited by streams that cut down through the soft shale of the escarpment front. The soils formed on these deposits are in the Herkimer series.

Climate

Lewis County has a continental type of climate. It is marked by short, cool summers and long, severe winters. In summer the elevation and comparatively dry atmosphere combine to give moderately high temperatures during the day and considerably lower temperatures at night. Winters begin early, and subzero temperatures are common. Snow usually falls during the last week in October (*8*). Data compiled from records of the United States Weather Bureau at Lowville give the temperature and precipitation for the principal agricultural area of the county. These are summarized in table 49.

TABLE 49.—*Temperature and precipitation at Lowville, Lewis County, New York*

[Elevation, 920 feet]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1934)	Wettest year (1945)	Average snowfall
	° F.	° F.	° F.	Inches	Inches	Inches	Inches
December	22. 4	66	−40	3. 18	2. 81	2. 76	22. 7
January	18. 4	64	−37	2. 95	1. 89	2. 39	24. 4
February	18. 6	58	−36	2. 67	. 41	2. 82	23. 2
Winter	19. 8	66	−40	8. 80	5. 11	7. 97	70. 3
March	28. 8	81	−25	2. 60	2. 24	2. 57	16. 0
April	42. 2	87	4	2. 56	3. 75	4. 41	3. 8
May	54. 4	96	20	3. 00	1. 65	4. 65	. 1
Spring	41. 8	96	−25	8. 16	7. 64	11. 63	19. 9
June	63. 3	99	31	3. 30	2. 44	1. 27	0
July	67. 9	100	35	3. 29	. 68	6. 32	0
August	65. 6	98	29	3. 20	. 88	1. 51	0
Summer	65. 6	100	29	9. 79	4. 00	9. 10	0
September	58. 3	95	22	3. 03	3. 05	7. 37	(3)
October	47. 1	87	9	3. 49	2. 16	6. 83	1. 0
November	35. 0	76	−15	3. 47	2. 40	6. 50	10. 3
Fall	46. 8	95	−15	9. 99	7. 61	20. 70	11. 3
Year	43. 5	100	−40	36. 74	24. 36	49. 40	101. 5

[1] Average temperature based on a 90-year record, through 1955; highest temperature on a 59-year record and lowest temperature on a 58-year record, through 1952.

[2] Average precipitation based on a 95-year record, through 1955; wettest and driest years based on an 88-year record, in the period 1827–1955; snowfall based on a 55-year record, through 1952.

[3] Trace.

Generally, precipitation is highest in summer. The average precipitation is 15.82 inches for the growing season, which generally extends from May 1 to September 30. Long-continued droughts are rare, but in the growing season short periods with less than normal rainfall are common. During these dry periods, growth of crops and pastures is hindered, particularly on the shallow and moderately deep soils in the central valley.

The moderate temperatures and the favorable precipitation during the growing season are favorable for growing forage crops. These factors have been important in the development of the county as an important dairy area. Pastures provide good grazing. Corn grows well in the central valley. Although some varieties of hybrid corn will mature in the central valley, corn is grown mainly for silage. Generally, corn is not grown on the Tug Hill Plateau or in the Adirondack part of the county because of the short growing season. At Lowville the average length of the frost-free season is 130 days, but frosts have occurred as late as June 12 and as early as August 27. The average dates for killing frosts are May 19 in spring and September 26 in fall.

The average annual snowfall is 101.5 inches at Lowville, 140 inches at Highmarket on the Tug Hill Plateau, and 141 inches at Number Four in the Adirondack foothills. The heavy snowfall on the Tug Hill Plateau is one reason why many farms have been abandoned in that part of the county. The snow isolates the area for long periods in the winter and hinders the daily delivery of milk that is required for dairy farming.

The prevailing winds are from the west and are responsible for the heavy snowfall on the Tug Hill Plateau. As these winds pass over Lake Ontario, they pick up moisture. This moisture is dropped when the winds are cooled as they pass over the plateau. Winds of destructive force seldom occur.

Water Supply

Lewis County has an abundant supply of water. The annual precipitation is heavy enough to maintain a flow of water in all except some of the minor streams. The only area where the water supply is sometimes critical is on the limestone terraces in the central valley. Many of the streams that cross this area head on the outer edge of the Tug Hill Plateau. These have small drainage areas and are dry late in summer and in fall. The farms in this area depend on wells for water. In seasons of normal rainfall the supply is sufficient for the needs of homes and livestock. When rainfall is below normal, however, even for short periods, many wells go dry. Limestone bedrock underlies this area at relatively shallow depths, and wells dug to bedrock or drilled into it are dependent on regular rainfall to maintain water levels. This is partly because the joints in the bedrock allow rapid loss of water to the lower substrata. Farms that are on lower lying areas than the first bedrock terrace have plenty of water. Wells in these areas can be dug at relatively shallow depths because the ground water is maintained at a constant level by the Black River.

East of the Black River, on the higher lying gravelly and sandy deltas, the ground water level is at considerable depth. Because of the high water-storing capacity of these deposits of sand and gravel, however, the ground water level remains constant. Small streams in this area flow continuously, even during the dry season late in summer and in fall. Some of the larger rivers flowing out of the Adirondack foothills and mountains are used as a source of power. There are 7 hydroelectric plants on the Beaver River and 1 plant each on the Moose, the Black, and the Oswegatchie Rivers. Numerous small lakes occur throughout the eastern part of the county.

Agriculture

The agriculture of Lewis County is based on the production and sale of fluid milk. The milk is transported by tank truck from the cooperative receiving stations to the markets where it is sold. The principal market is New York City. In 1954, there were about 226½ million pounds of whole milk sold. The main crops grown in the county are those used in a typical dairy-farm rotation.

Approximately 38 percent of the acreage in the county, or 314,543 acres, was in farms in 1954 according to the

United States Census of Agriculture. The following list shows how the land in farms was used:

	Acres
Cropland harvested	93, 683
Cropland used only for pasture	33, 209
Cropland not harvested and not pastured	10, 286
Woodland (on farms) pastured	38, 834
Woodland (on farms) not pastured	47, 247
Other pasture (not cropland and not woodland)	80, 038
Other land (homesteads, roads, wasteland, etc.)	11, 246
Cropland, total	137, 178
Land pastured, total	152, 081
Woodland, total	86, 081

In 1954, farms ranged in size from less than 10 to more than 1,000 acres. Of the 1,541 farms in the county, 21.9 percent were 100 acres or less in size; 43.9 percent were between 100 and 219 acres; 29.9 percent were between 220 and 499 acres; and 4.3 percent were 500 acres or more in size. The average size of farms in the county was 204.1 acres in 1954 compared to 188.5 acres in 1950.

Also in 1954, there were 1,183 dairy farms in the county, 60 poultry farms, 10 farms where livestock other than poultry or dairy cattle was the main source of income, and 30 general farms. The rest of the farms in the county were miscellaneous and unclassified. Most of the farms were operated by owners. Tenants operated only 1.6 percent of the total number.

Wildlife and Recreation

Lewis County provides many opportunities for developing wildlife. The idle areas and naturally revegetated land would be particularly suitable for that purpose. The swamps and the wet areas can be developed as waterfowl marshes. Cedar swamps, in particular, have high value as wintering areas for deer. The alder thickets on abandoned wet pasturelands are a haven for ruffed grouse and woodcock. Such birds also occur in abundance in upland areas where there is a volunteer growth of thornapple, white pine, gray birch, and aspen.

The many small lakes in the eastern part of the county are important recreational centers. All of the streams draining into the Black River from the east provide good fishing, notably for trout.

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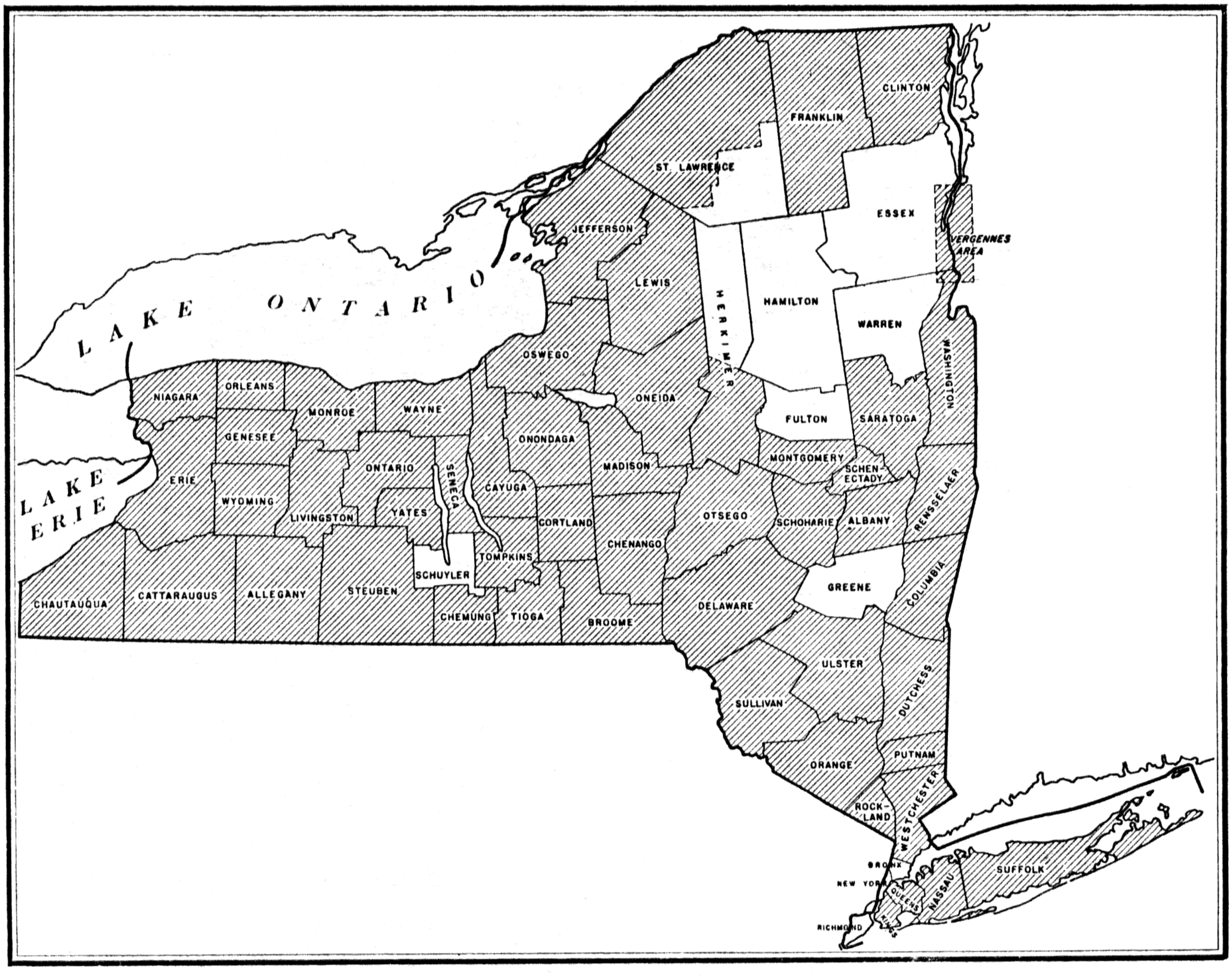

Areas surveyed in New York shown by shading.

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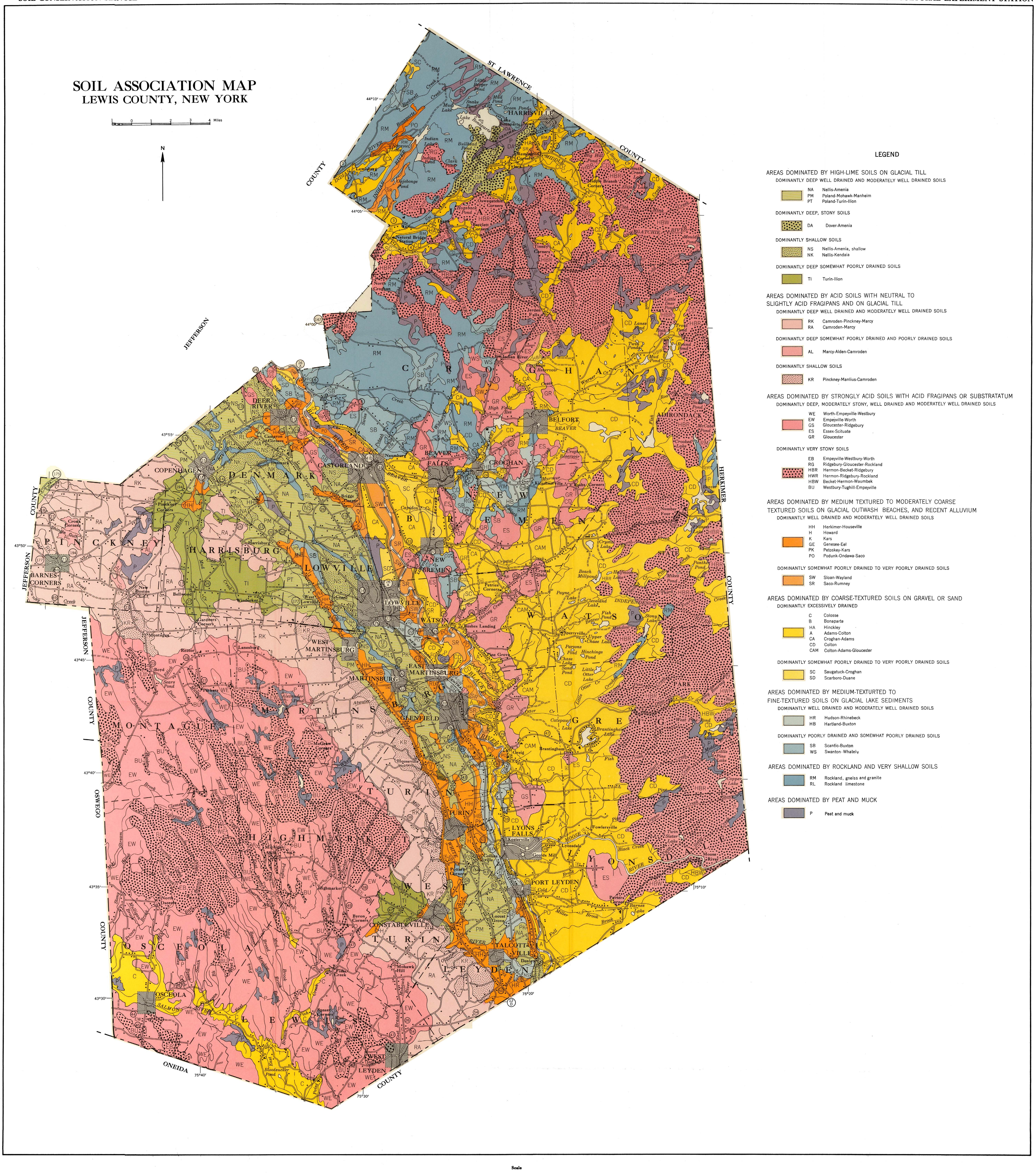
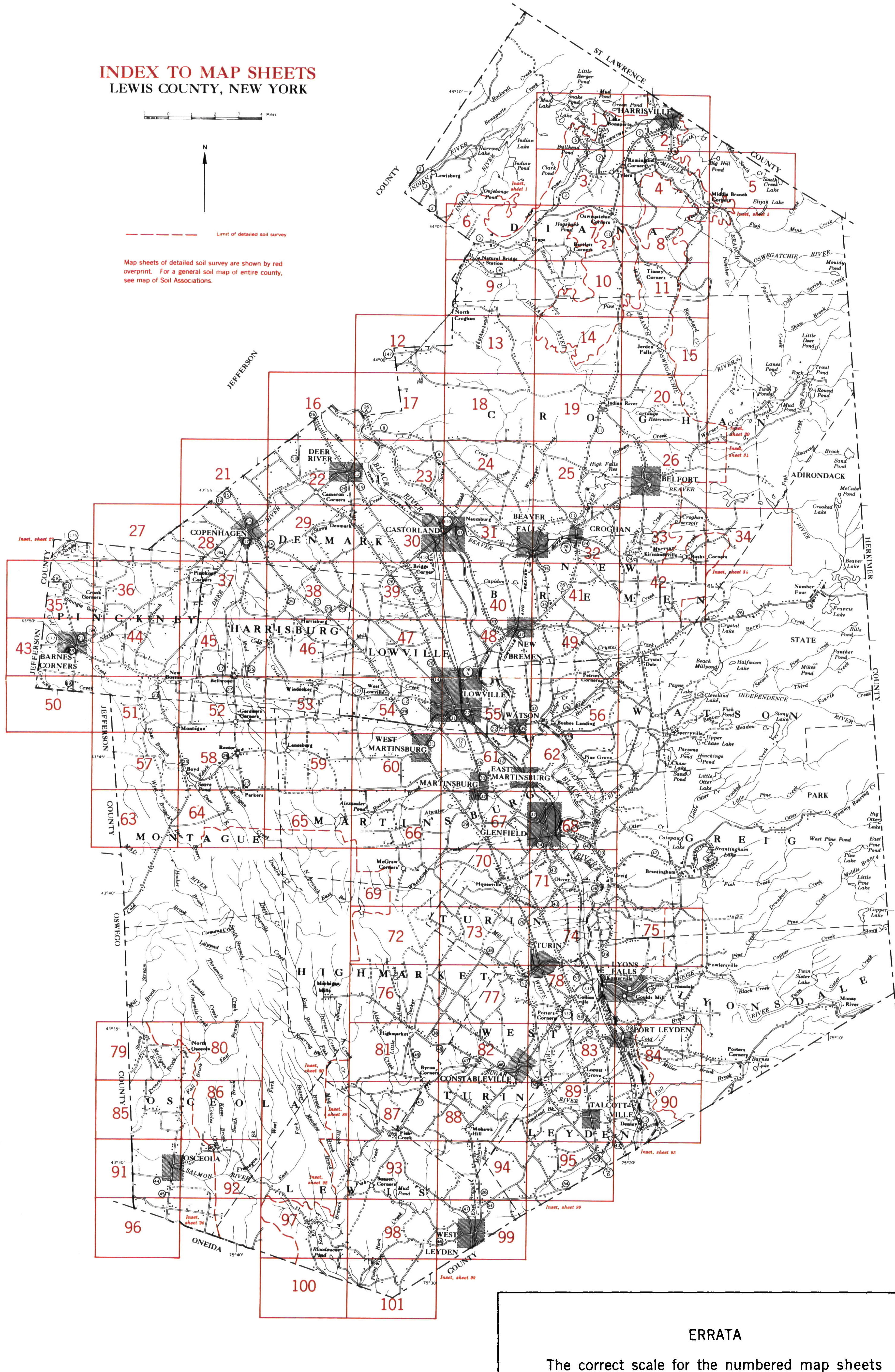
SOIL ASSOCIATIONS MAP
LEWIS COUNTY - NEW YORK





ERRATA

The correct scale for the numbered map sheets in the soil survey of Lewis County, New York, is 1:15,840, or 4 inches to the mile.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

LEWIS COUNTY, NEW YORK

CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

SOILS LEGEND

SYMBOL	NAME
AaA	Adams loamy fine sand, 0-3 percent slopes
AaB	Adams loamy fine sand, 3-8 percent slopes
AaC	Adams loamy fine sand, 8-15 percent slopes
AaD	Adams loamy fine sand, 15-35 percent slopes
AaS	Adams loamy fine sand, 0-15 percent slopes, severely blown
AbB	Adams and Colton soils, morainic, 3-8 percent slopes
AbC	Adams and Colton soils, morainic, 8-15 percent slopes
AcA	Alden silt loam, 0-3 percent slopes
AdA	Alluvial land
AeB	Amenia loam, shallow, 2-8 percent slopes
AfA	Amenia loam, moderately deep, 0-3 percent slopes
AfB	Amenia loam, moderately deep, 3-8 percent slopes
AgA	Amenia loam, deep, 0-3 percent slopes
AgB	Amenia loam, deep, 3-8 percent slopes
BaA	Biddeford silty clay loam, 0-2 percent slopes
BbD	Blownout land
BcB	Bonaparte gravelly sandy loam, 2-8 percent slopes
BcC	Bonaparte gravelly sandy loam, 8-15 percent slopes
BcE	Bonaparte gravelly sandy loam, 15-45 percent slopes
BdA	Buxton silt loam, 0-2 percent slopes
BdB	Buxton silt loam, 2-6 percent slopes
BeB	Buxton very fine sandy loam, 0-6 percent slopes
CaA	Camroden silt loam, 0-3 percent slopes
CaB	Camroden silt loam, 3-8 percent slopes
CaC	Camroden silt loam, 8-15 percent slopes
CaD	Camroden silt loam, 15-25 percent slopes
CbA	Chagrin silt loam, 0-2 percent slopes
CcA	Colonie fine sandy loam, 0-3 percent slopes
CcB	Colonie fine sandy loam, 3-8 percent slopes
CcC	Colonie fine sandy loam, 8-15 percent slopes
CcD	Colonie fine sandy loam, 15-35 percent slopes
CdB	Colosse cobbly loamy fine sand, 2-8 percent slopes
CdC	Colosse cobbly loamy fine sand, 8-15 percent slopes
CeB	Colosse gravelly fine sandy loam, 2-8 percent slopes
CfD	Colosse soils, 15-45 percent slopes
CgB	Colton gravelly loamy sand, 0-8 percent slopes
CgC	Colton gravelly loamy sand, 8-15 percent slopes
ChA	Colton loamy fine sand, 0-3 percent slopes
ChB	Colton loamy fine sand, 3-8 percent slopes
ChC	Colton loamy fine sand, 8-15 percent slopes
CkD	Colton loamy sand and cobbly loamy sand, 15-25 percent slopes
CkE	Colton loamy sand and cobbly loamy sand, 25-45 percent slopes
CmS	Colton soils, 0-15 percent slopes, severely blown
CnS	Colton and Adams soils, 15-35 percent slopes, severely blown
CoB	Croghan loamy fine sand, 0-5 percent slopes
DaB	Dover stony loam, 3-8 percent slopes
DaC	Dover stony loam, 8-15 percent slopes
DbB	Dover very stony loam, 3-15 percent slopes
DbD	Dover very stony loam, 15-35 percent slopes
DcB	Duane sandy loam, 0-5 percent slopes
EaA	Eel silt loam, 0-2 percent slopes
EbB	Elmwood sandy loam, 0-6 percent slopes
EcB	Empeyville flaggy silt loam, 3-8 percent slopes
EcC	Empeyville flaggy silt loam, 8-15 percent slopes
EdB	Empeyville stony loam, 3-8 percent slopes
EdC	Empeyville stony loam, 8-15 percent slopes
EeC	Empeyville very stony loam, 3-15 percent slopes
EfB	Essex stony fine sandy loam, 3-8 percent slopes
EfC	Essex stony fine sandy loam, 8-15 percent slopes
EfD	Essex stony fine sandy loam, 15-25 percent slopes
FaA	Fonda silt loam, 0-3 percent slopes
FbA	Fresh water marsh
GaB	Gage silt loam, shallow, 0-8 percent slopes
GbA	Gage silt loam, 0-3 percent slopes
GbB	Gage silt loam, 3-8 percent slopes
GcB	Galen fine sandy loam, 0-6 percent slopes
GdA	Genesee silt loam, 0-2 percent slopes
GeA	Genesee silt loam, alluvial fans, 0-3 percent slopes
GfA	Glenfield silt loam, neutral, 0-5 percent slopes
GgA	Glenfield silt loam, acid, 0-3 percent slopes

SYMBOL	NAME
GhB	Gloucester fine sandy loam, neutral substratum, 3-8 percent slopes
GhC	Gloucester fine sandy loam, neutral substratum, 8-15 percent slopes
GkB	Gloucester stony fine sandy loam, 3-8 percent slopes
GkC	Gloucester stony fine sandy loam, 8-15 percent slopes
GmB	Gloucester stony sandy loam, 3-8 percent slopes
GmC	Gloucester stony sandy loam, 8-15 percent slopes
GmD	Gloucester stony sandy loam, 15-25 percent slopes
GnD	Gloucester very stony fine sandy loam, shallow, 5-25 percent slopes
GoC	Gloucester and Essex very stony fine sandy loams, 3-15 percent slopes
GoD	Gloucester and Essex very stony fine sandy loams, 15-35 percent slopes
GpD	Gloucester and Scituate soils, extremely stony, 3-35 percent slopes
GrA	Granby fine sandy loam, 0-2 percent slopes
GsA	Groveton fine sandy loam, 0-3 percent slopes
HaB	Hartland very fine sandy loam, 2-6 percent slopes
HaC	Hartland very fine sandy loam, 6-12 percent slopes
HaD	Hartland very fine sandy loam, 12-20 percent slopes
HbA	Herkimer silt loam, neutral, 0-3 percent slopes
HbB	Herkimer silt loam, neutral, 3-8 percent slopes
HbC	Herkimer silt loam, neutral, 8-15 percent slopes
HbD	Herkimer silt loam, 15-25 percent slopes
HcA	Herkimer silt loam, acid, 0-3 percent slopes
HcB	Herkimer silt loam, acid, 3-8 percent slopes
HcC	Herkimer silt loam, acid, 8-15 percent slopes
HdA	Hinckley sandy loam, neutral substratum, 0-3 percent slopes
HdB	Hinckley sandy loam, neutral substratum, 3-8 percent slopes
HdC	Hinckley sandy loam, neutral substratum, 8-15 percent slopes
HeA	Houseville silt loam, neutral, 0-3 percent slopes
HeB	Houseville silt loam, neutral, 3-8 percent slopes
HfA	Houseville silt loam, acid, 0-3 percent slopes
HfB	Houseville silt loam, acid, 3-10 percent slopes
HgA	Howard loam, 0-3 percent slopes
HgB	Howard loam, 3-8 percent slopes
HgC	Howard loam, 8-15 percent slopes
HhD	Howard and Kars soils, 15-35 percent slopes
HkB	Hudson silt loam, 0-6 percent slopes
IaA	Ilion silt loam, 0-3 percent slopes
IaB	Ilion silt loam, 3-8 percent slopes
JaA	Junius fine sandy loam, 0-3 percent slopes
KaA	Kars gravelly loam, 0-3 percent slopes
KaB	Kars gravelly loam, 3-8 percent slopes
KaC	Kars gravelly loam, 8-15 percent slopes
KbA	Kendaia silt loam, 0-3 percent slopes
KbB	Kendaia silt loam, 3-8 percent slopes
KcA	Kendaia silt loam, shallow, 0-3 percent slopes
KcB	Kendaia silt loam, shallow, 3-8 percent slopes
KdB	Kendaia very stony silt loam, 0-15 percent slopes
LaA	Lobdell shaly silt loam, 0-3 percent slopes
LbA	Lobdell silt loam, 0-2 percent slopes
LcA	Lyons silt loam, 0-3 percent slopes
LdA	Lyons silt loam, shallow, 0-3 percent slopes
LeA	Lyons very stony silt loam, 0-3 percent slopes
MaA	Madalin silt loam, 0-2 percent slopes
MbA	Made land
McA	Manheim silt loam, 0-3 percent slopes
McB	Manheim silt loam, 3-8 percent slopes
MdB	Manlius silt loam, 0-8 percent slopes
MdC	Manlius silt loam, 8-15 percent slopes
MdD	Manlius silt loam, 15-35 percent slopes
MeA	Marcy silt loam, 0-3 percent slopes
MeB	Marcy silt loam, 3-8 percent slopes
MfB	Melrose sandy loam, 0-6 percent slopes
MfC	Melrose sandy loam, 6-12 percent slopes
MgB	Mohawk silt loam, 2-8 percent slopes
MgC	Mohawk silt loam, 8-15 percent slopes
MgD	Mohawk silt loam, 15-25 percent slopes
NaE	Nellis loam, 25-35 percent slopes
NbB	Nellis loam, shallow, 0-8 percent slopes
NbC	Nellis loam, shallow, 8-15 percent slopes
NbD	Nellis loam, shallow, 15-25 percent slopes

SYMBOL	NAME
NcB	Nellis loam, moderately deep, 2-8 percent slopes
NcC	Nellis loam, moderately deep, 8-15 percent slopes
NdD	Nellis loam, moderately deep and deep, 15-25 percent slopes
NeB	Nellis loam, deep, 2-8 percent slopes
NeC	Nellis loam, deep, 8-15 percent slopes
NfC	Nellis loam, ledgy, 3-15 percent slopes
NfD	Nellis loam, ledgy, 15-35 percent slopes
NgC	Nellis very stony loam, 3-15 percent slopes
NgD	Nellis very stony loam, 15-35 percent slopes
OaA	Ondawa loam, 0-2 percent slopes
ObB	Ondawa loamy sand, 2-5 percent slopes
PaA	Peat and muck, shallow
PbA	Peat and muck, deep
PcA	Petoskey fine sandy loam, 0-3 percent slopes
PcB	Petoskey fine sandy loam, 3-8 percent slopes
PcC	Petoskey fine sandy loam, 8-15 percent slopes
PcD	Petoskey fine sandy loam, 15-25 percent slopes
PdE	Petoskey and Hartland fine sandy loams, 25-35 percent slopes
PeB	Pinckney silt loam, 3-8 percent slopes
PeC	Pinckney silt loam, 8-15 percent slopes
PeD	Pinckney silt loam, 15-25 percent slopes
PeE	Pinckney silt loam, 25-35 percent slopes
PfE	Pinckney silt loam, 15-35 percent slopes, eroded
PgA	Podunk loam and fine sandy loam, 0-2 percent slopes
PhB	Poland silt loam, 3-8 percent slopes
PhC	Poland silt loam, 8-15 percent slopes
PhD	Poland silt loam, 15-25 percent slopes
PkE	Poland and Mohawk silt loams, 25-35 percent slopes
RaB	Rhinebeck silt loam, 1-6 percent slopes
RaC	Rhinebeck silt loam, 6-12 percent slopes
RbB	Ridgebury stony loam, 0-5 percent slopes
RcB	Ridgebury soils, extremely stony, 0-8 percent slopes
RdA	Riverwash
ReE	Rockland, gneiss
RfE	Rockland, limestone
RgE	Rough broken land
RhA	Rumney silt loam, 0-2 percent slopes
SaA	Saco silt loam, 0-2 percent slopes
SbA	Saugatuck loamy fine sand, 0-3 percent slopes
ScB	Scantic silt loam, 0-6 percent slopes
SdA	Scantic silty clay loam, 0-3 percent slopes
SeA	Scarboro fine sandy loam, 0-2 percent slopes
SfA	Scarboro loamy sand, neutral phase, 0-2 percent slopes
SgB	Scituate stony fine sandy loam, 3-8 percent slopes
ShC	Scituate very stony fine sandy loam, 3-15 percent slopes
SkA	Sloan silt loam, 0-2 percent slopes
SmA	Suffield silt loam, 0-2 percent slopes
SmB	Suffield silt loam, 2-6 percent slopes
SnC	Suffield and Hudson silt loams, 6-12 percent slopes
SoA	Swanton fine sandy loam, 0-2 percent slopes
TaB	Tughill stony and very stony silt loams, 0-5 percent slopes
TbA	Turin silt loam, 0-3 percent slopes
TbB	Turin silt loam, 3-8 percent slopes
TbC	Turin silt loam, 8-15 percent slopes
WaA	Wallkill silt loam, 0-2 percent slopes
WbA	Walpole loam, 0-4 percent slopes
WcA	Wayland silt loam, 0-2 percent slopes
WdA	Westbury stony loam, 0-3 percent slopes
WdB	Westbury stony loam, 3-8 percent slopes
WeB	Westbury very stony loam, 0-8 percent slopes
WfA	Westland silt loam, 0-2 percent slopes
WgA	Whately fine sandy loam, 0-2 percent slopes
WhB	Whitman soils, extremely stony, 0-8 percent slopes
WkB	Worth flaggy silt loam, 3-8 percent slopes
WkC	Worth flaggy silt loam, 8-15 percent slopes
WmB	Worth stony loam, 3-8 percent slopes
WmC	Worth stony loam, 8-15 percent slopes
WmD	Worth stony loam, 15-25 percent slopes
WnC	Worth very stony loam, 3-15 percent slopes
WnD	Worth very stony loam, 15-35 percent slopes

Soils surveyed 1948-1954 by C. S. Pearson, Arthur Sherrell, Robert Grossman, and H. DeRoo, Cornell University Agricultural Experiment Station, and Martin Ziebell and W. F. Croney, U. S. Department of Agriculture.
Correlation by Arnold J. Baur and Marlin G. Cline, Soil Conservation Service.

Soil map constructed 1958 by Cartographic Division, Soil Conservation Service, USDA, from 1943, 1944, 1948, and 1949 aerial photographs. Controlled mosaic based on New York plane coordinate system, central zone, transverse Mercator projection, 1927 North American datum.

1

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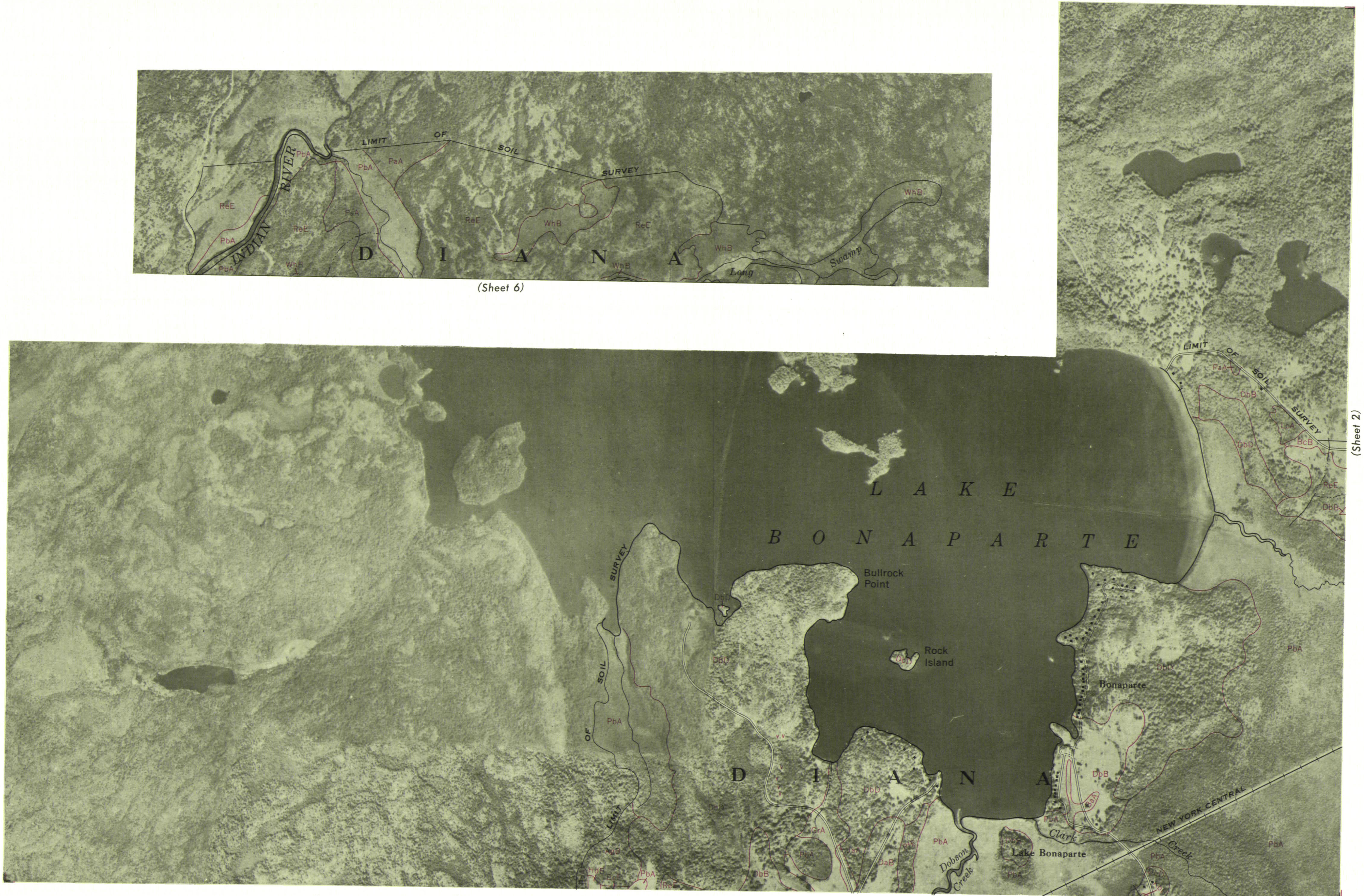

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LEWIS COUNTY, NEW YORK

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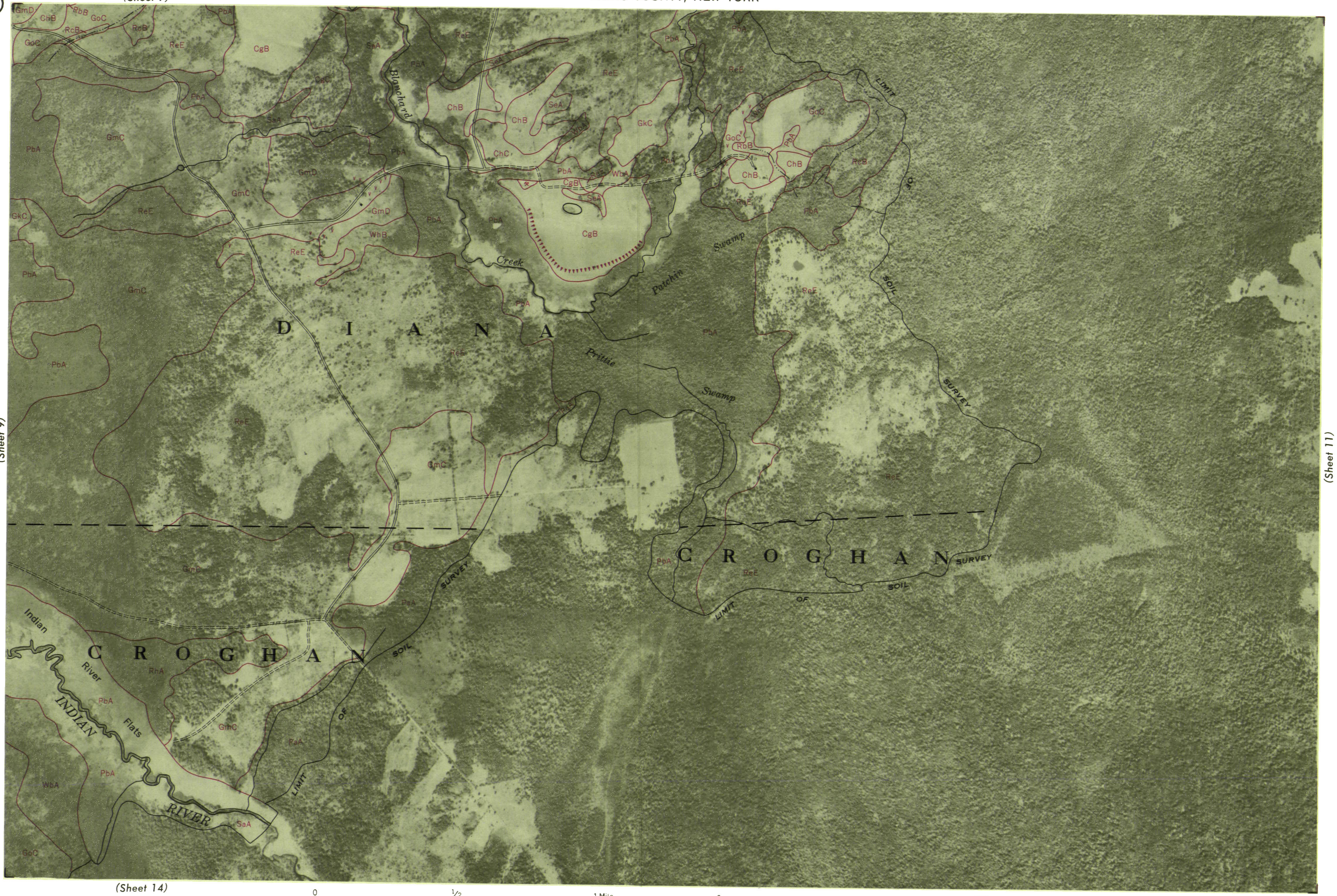

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0 1/2 1 Mile

Scale 1:20000

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(Sheet 97)

LEWIS COUNTY, NEW YORK

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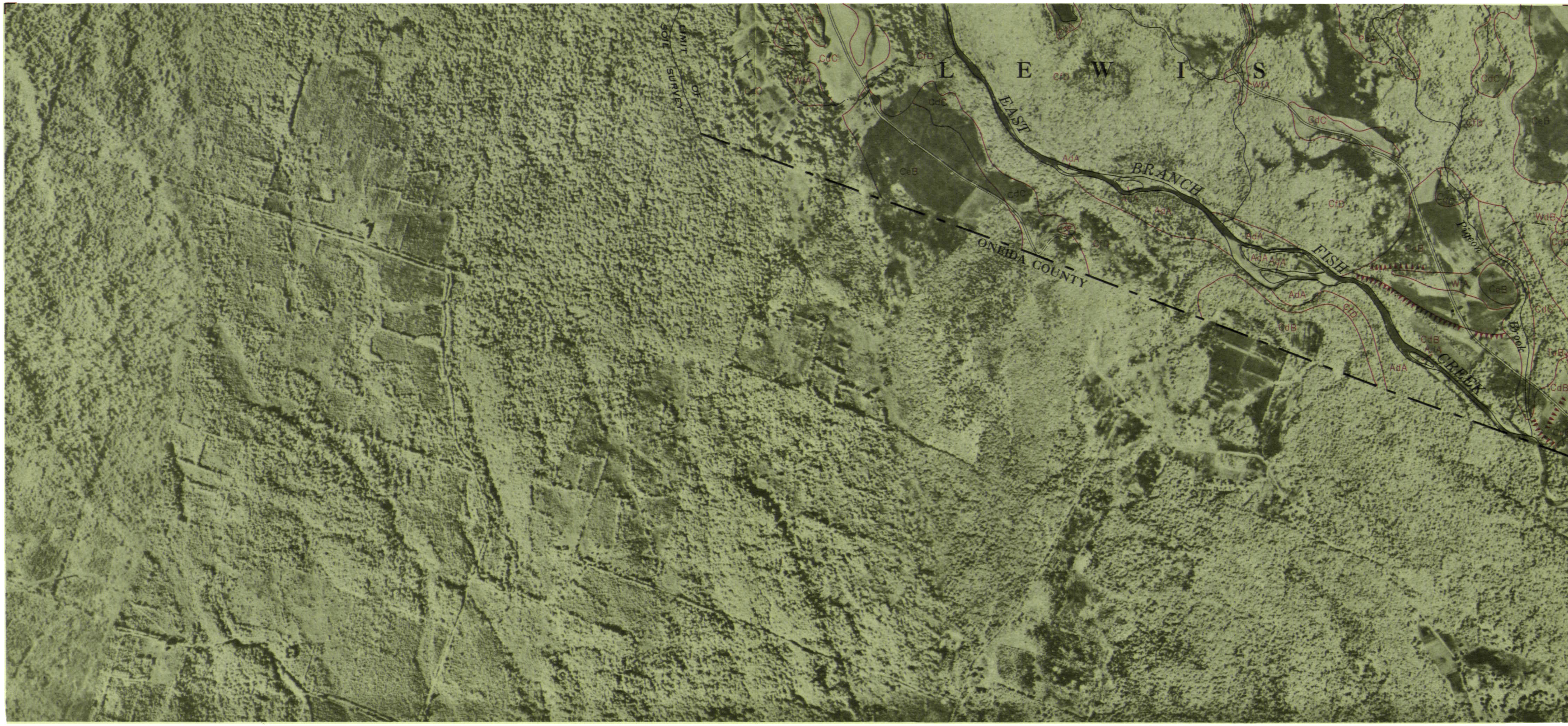

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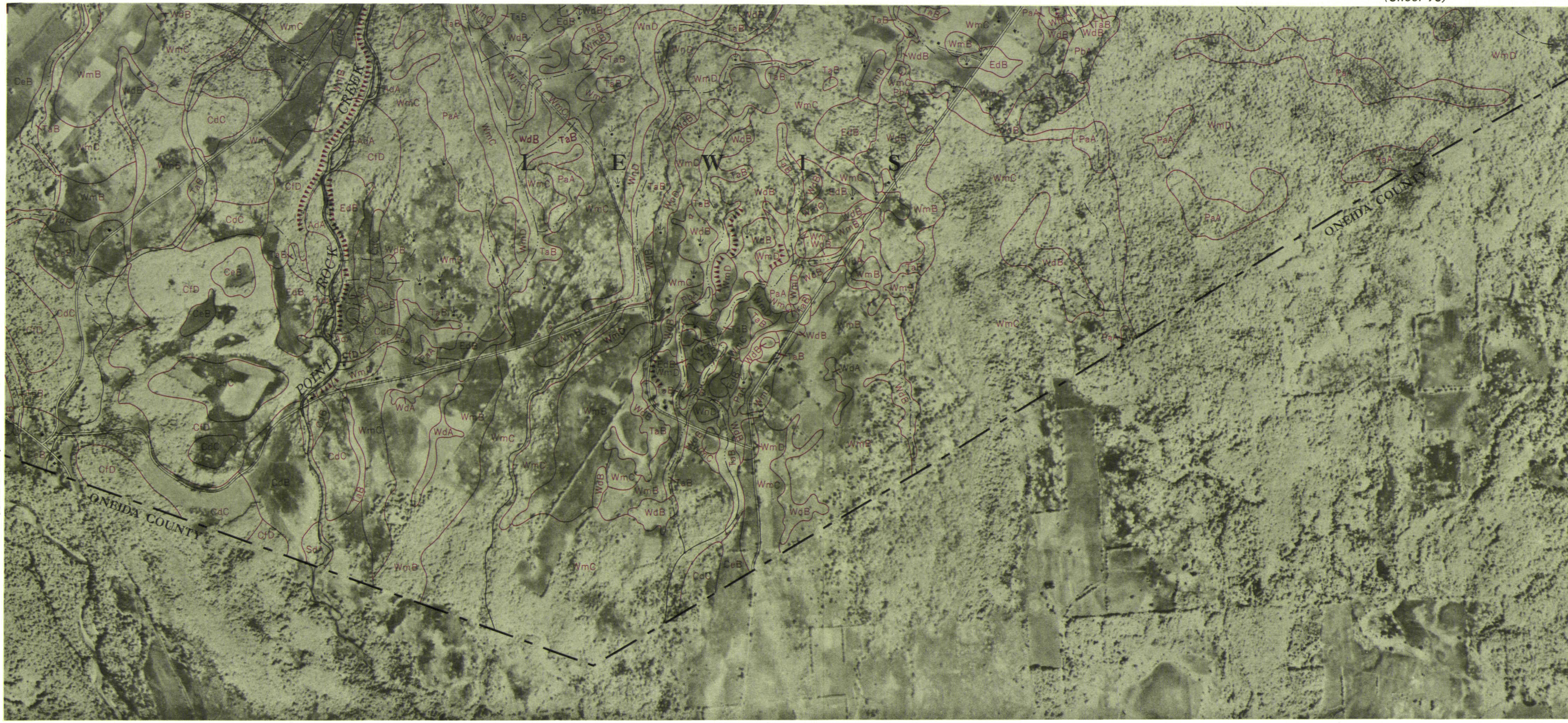

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0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

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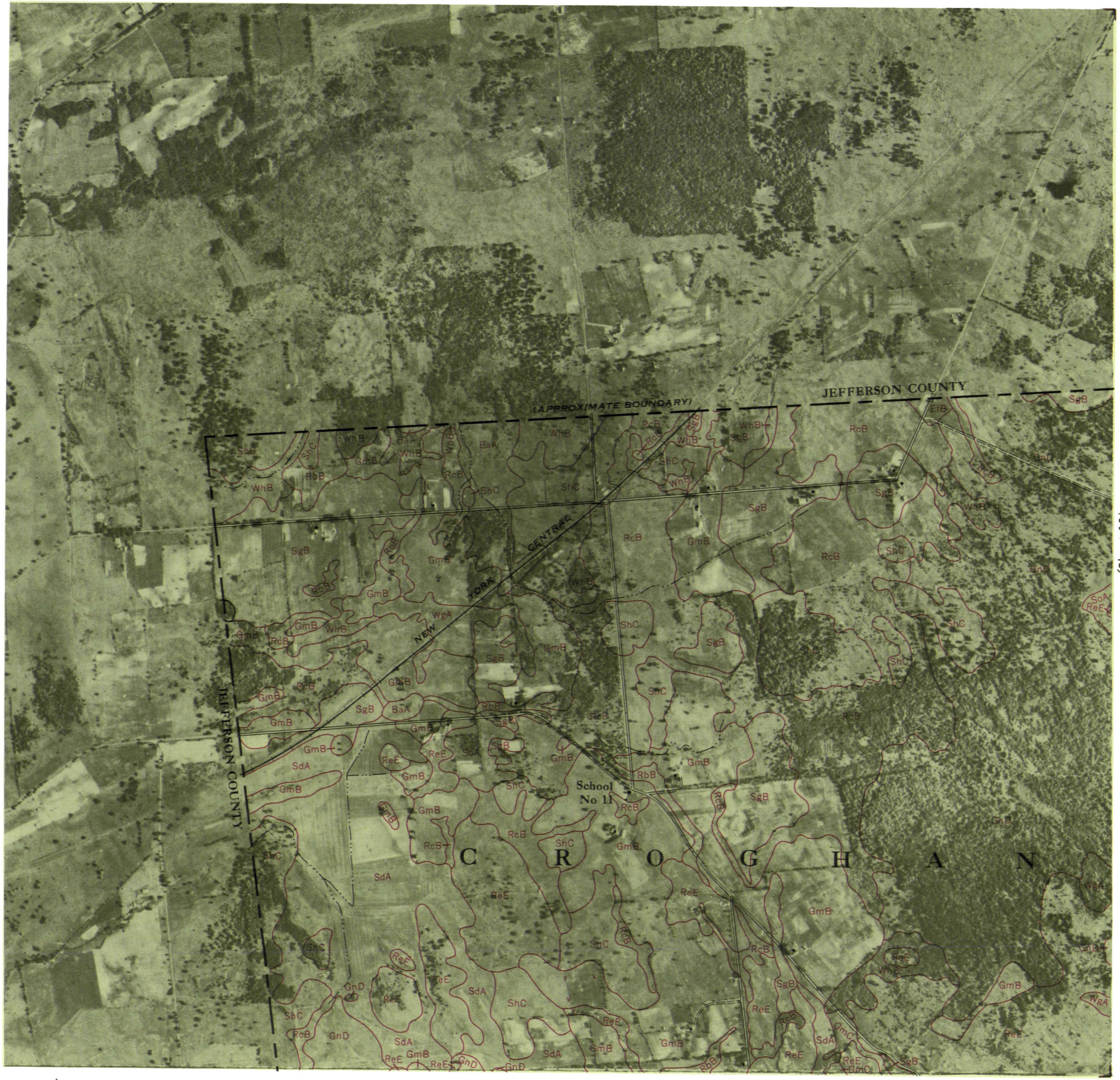

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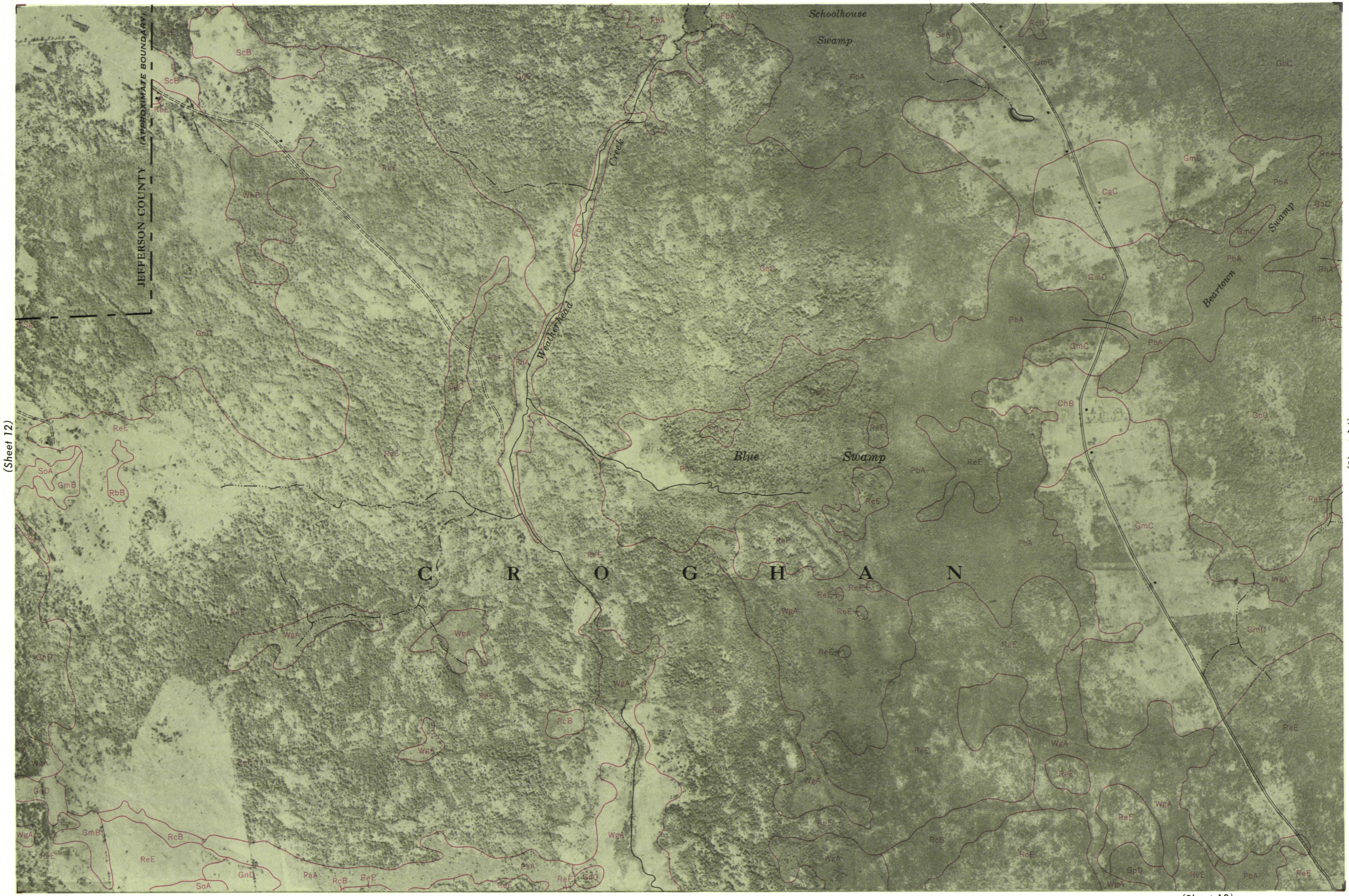

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LEWIS COUNTY, NEW YORK

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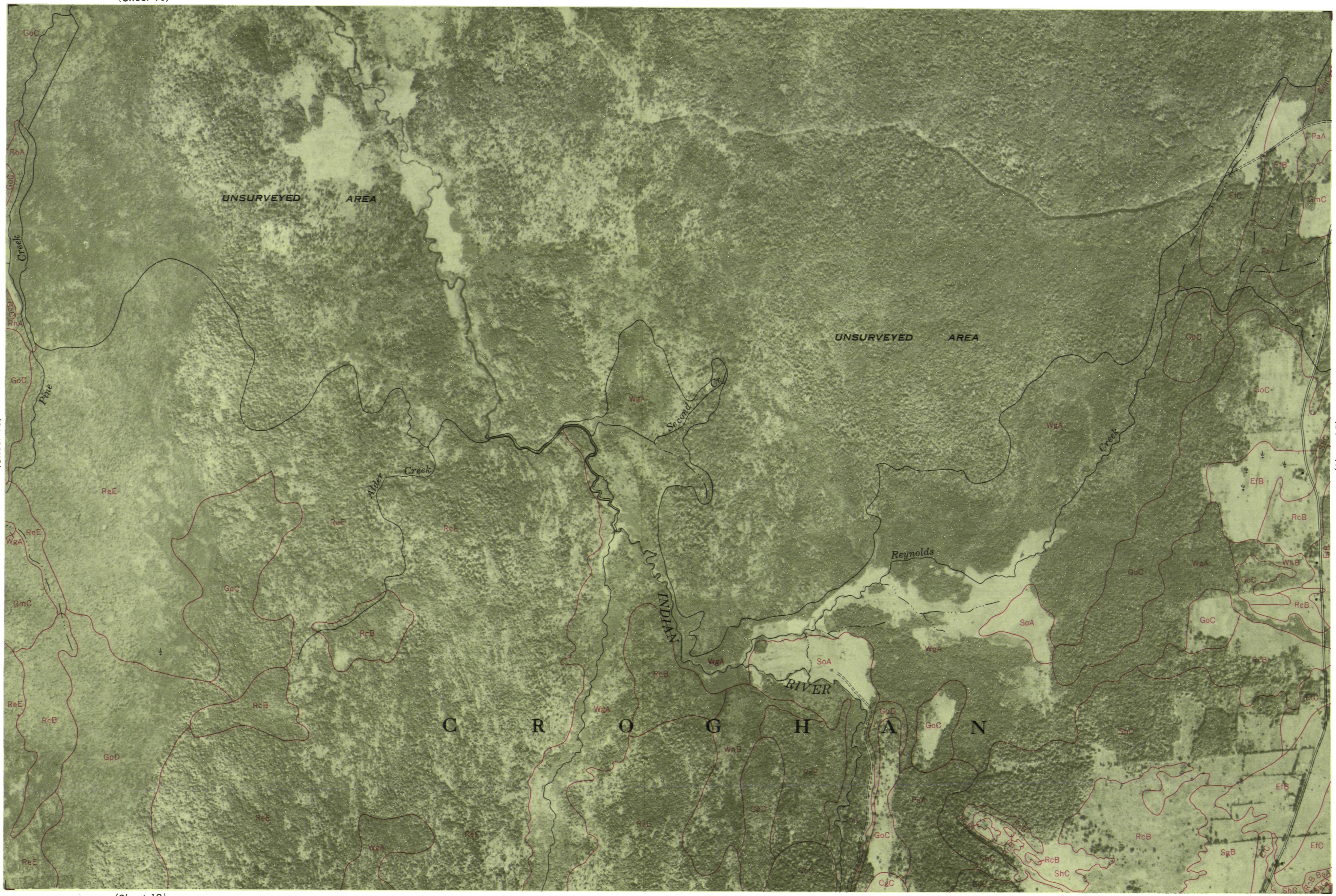

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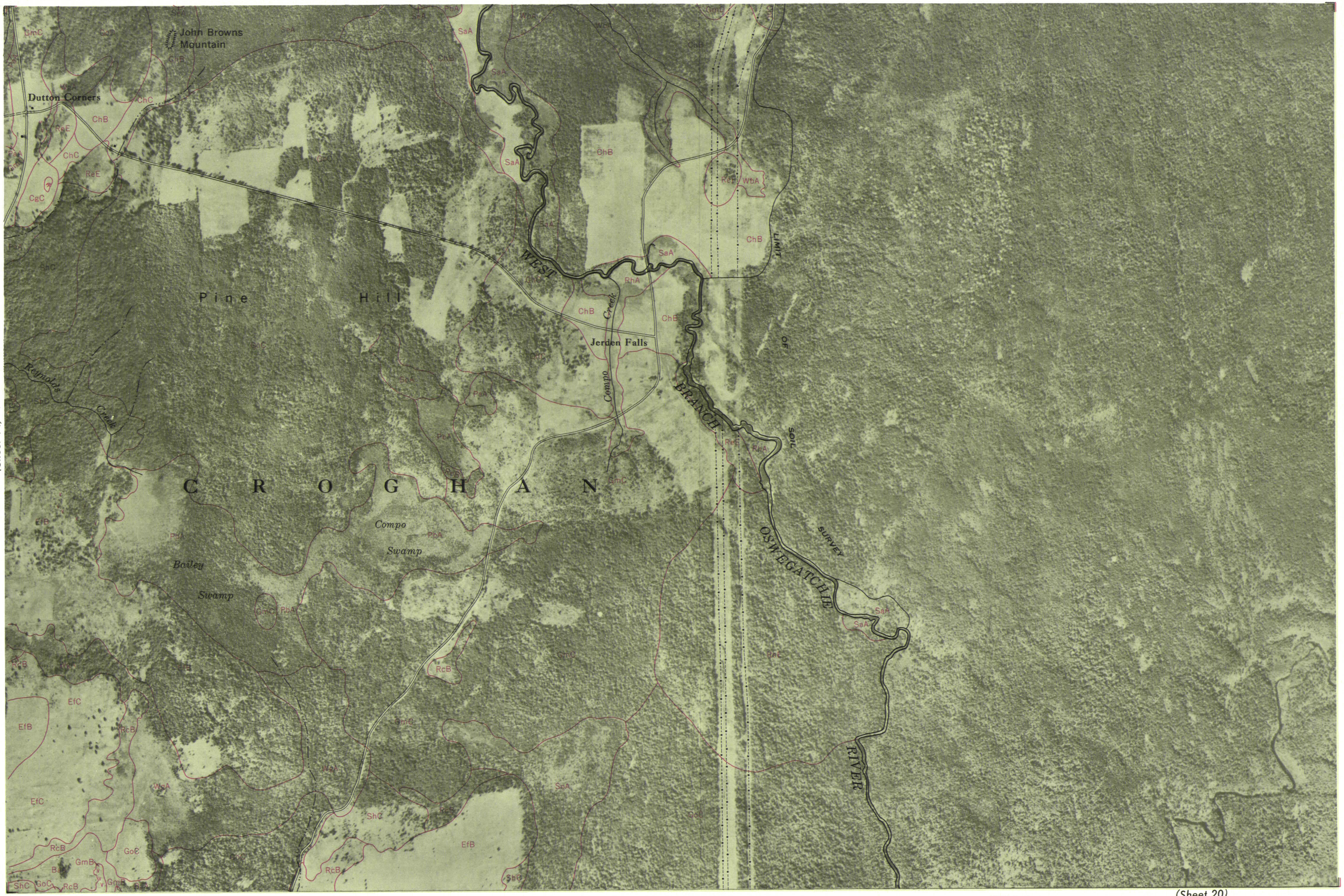

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LEWIS COUNTY, NEW YORK

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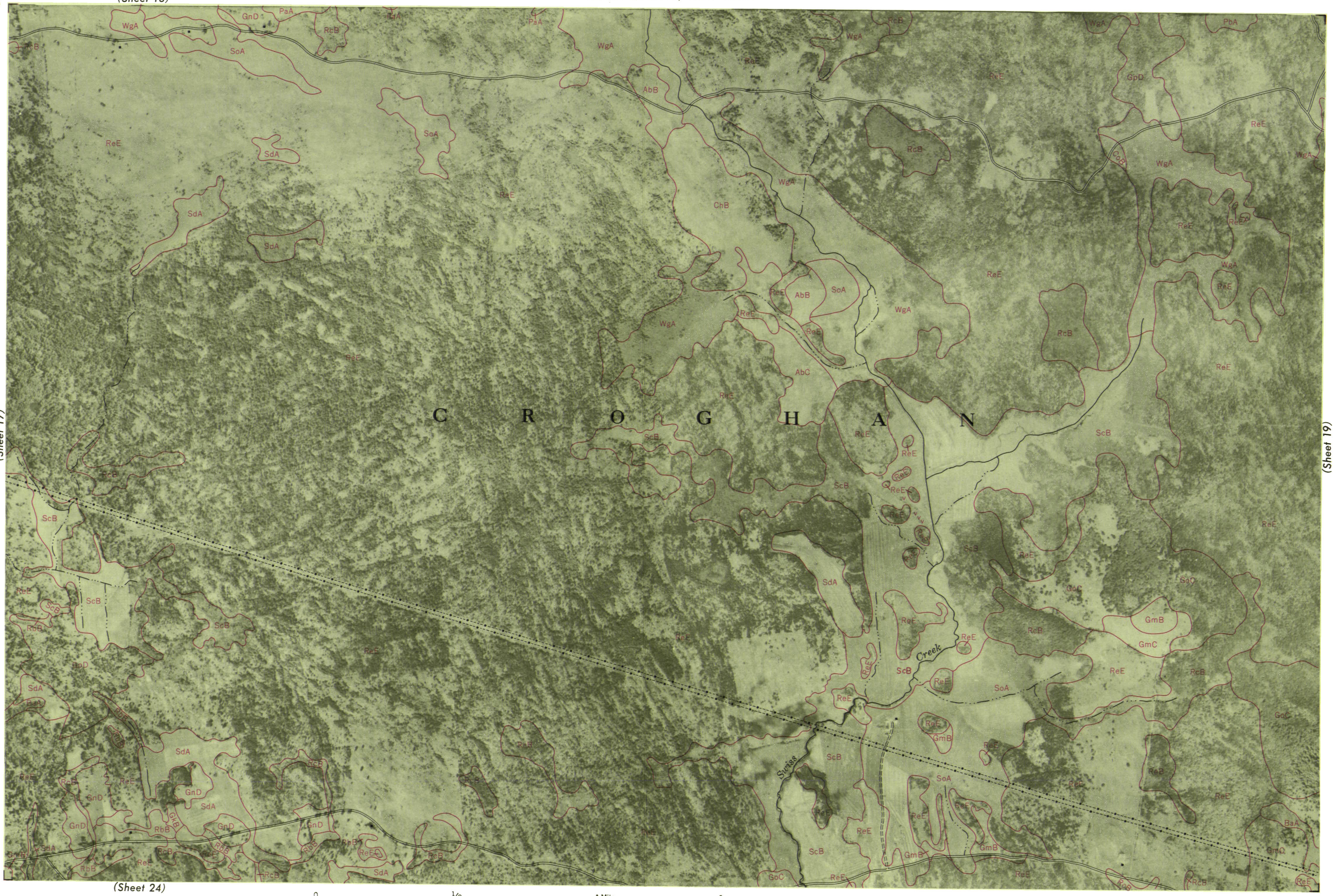

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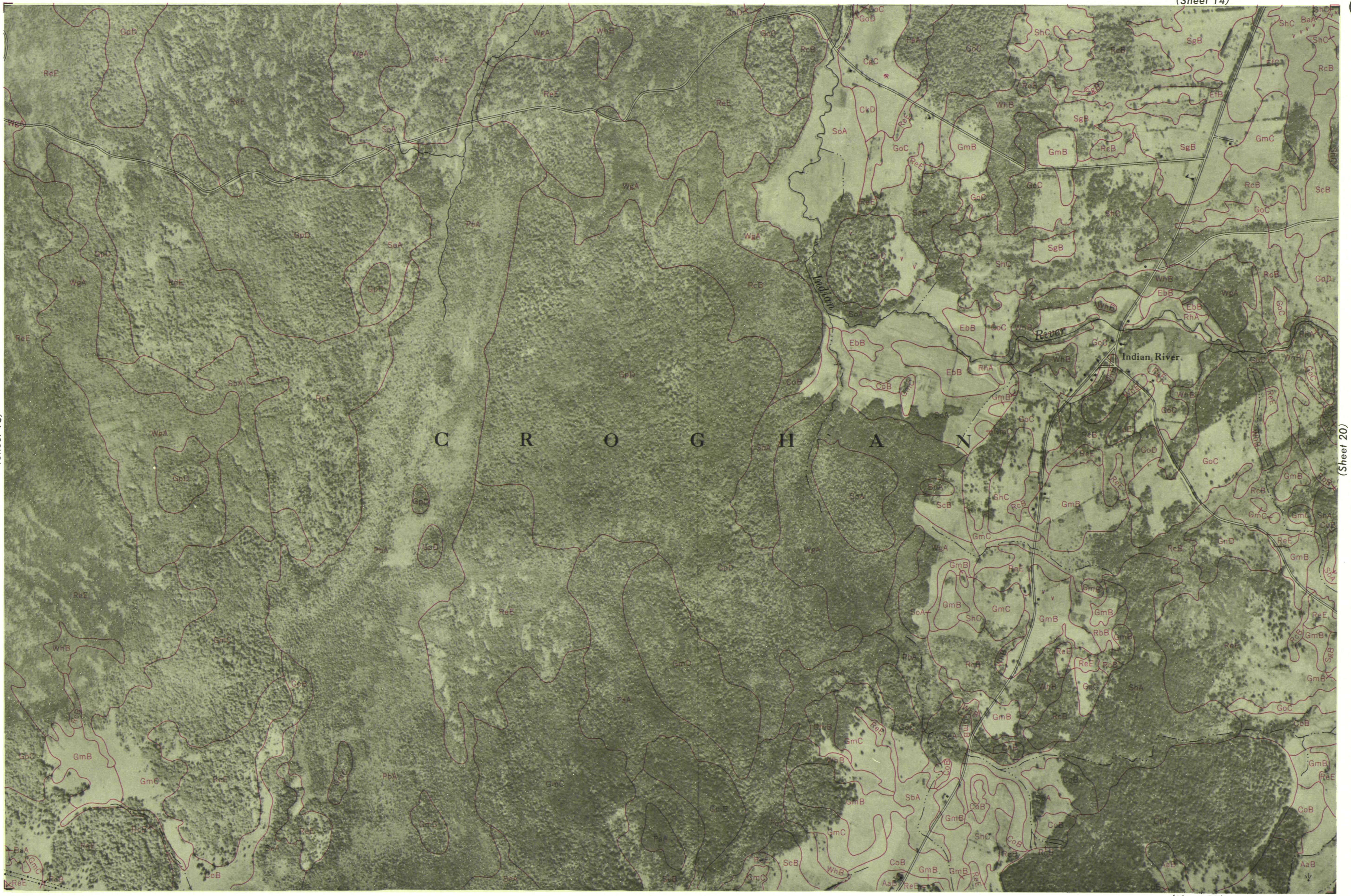

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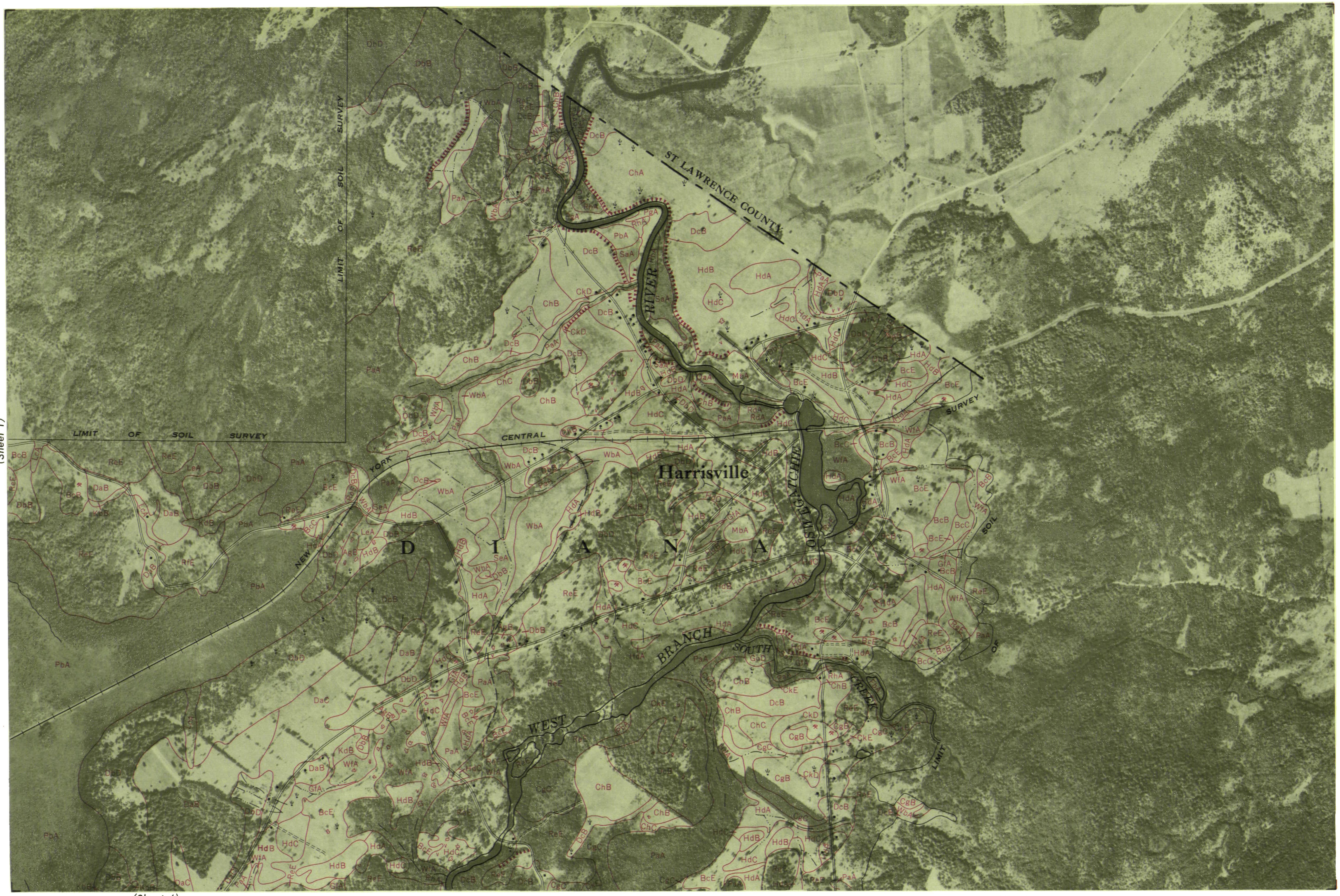

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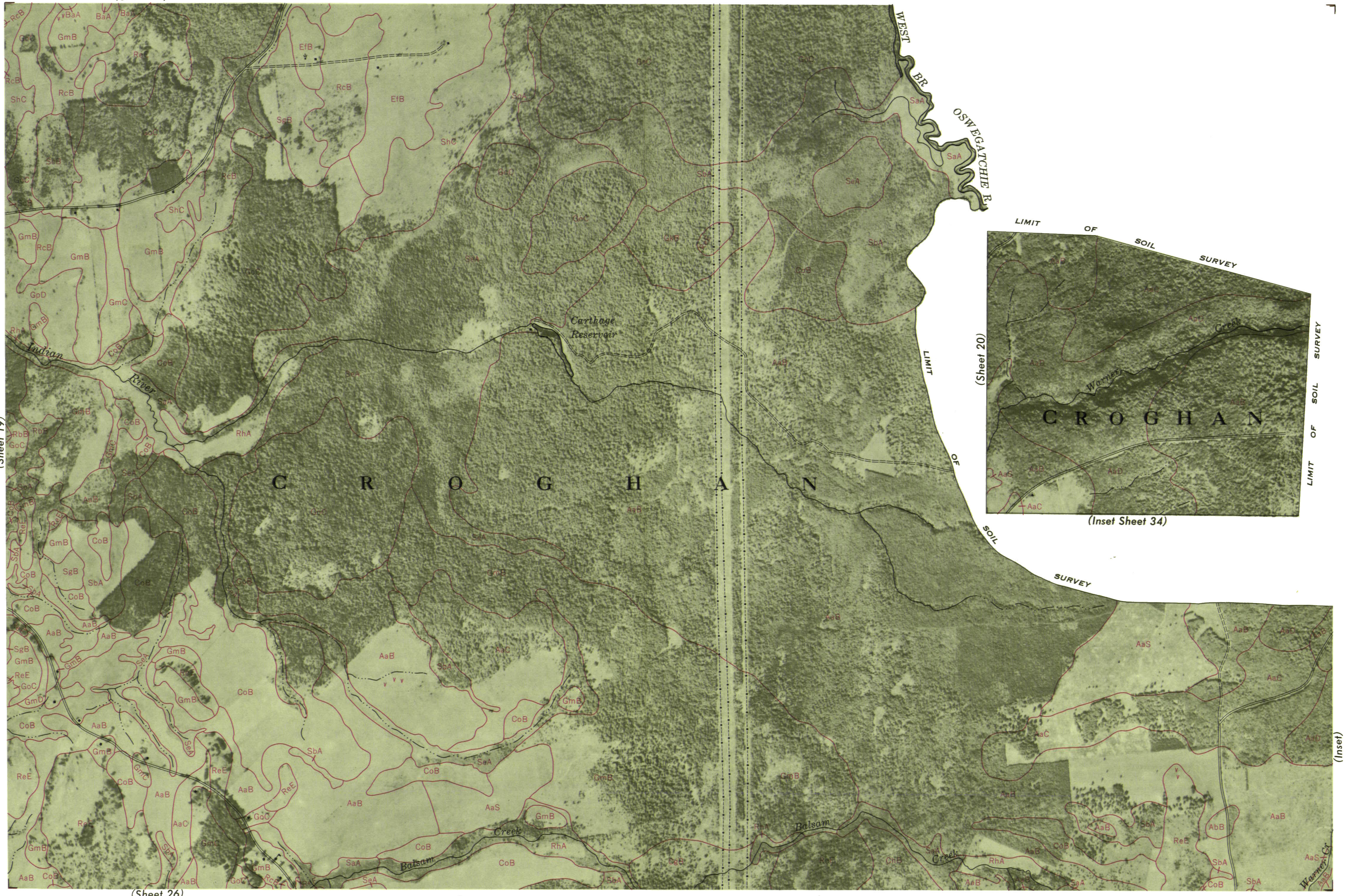
LEWIS COUNTY, NEW YORK



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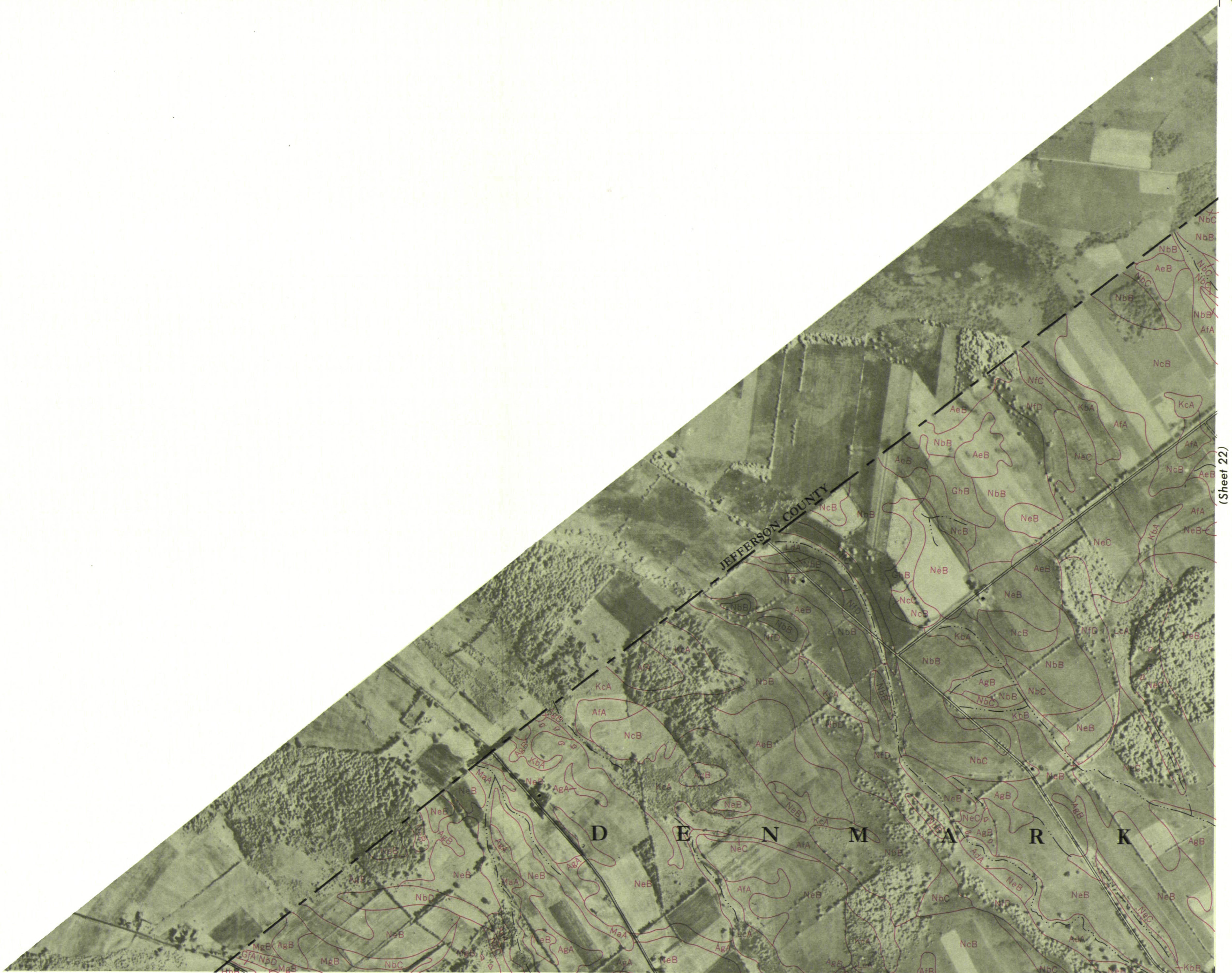

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0 1/2 1 Mile

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LEWIS COUNTY, NEW YORK

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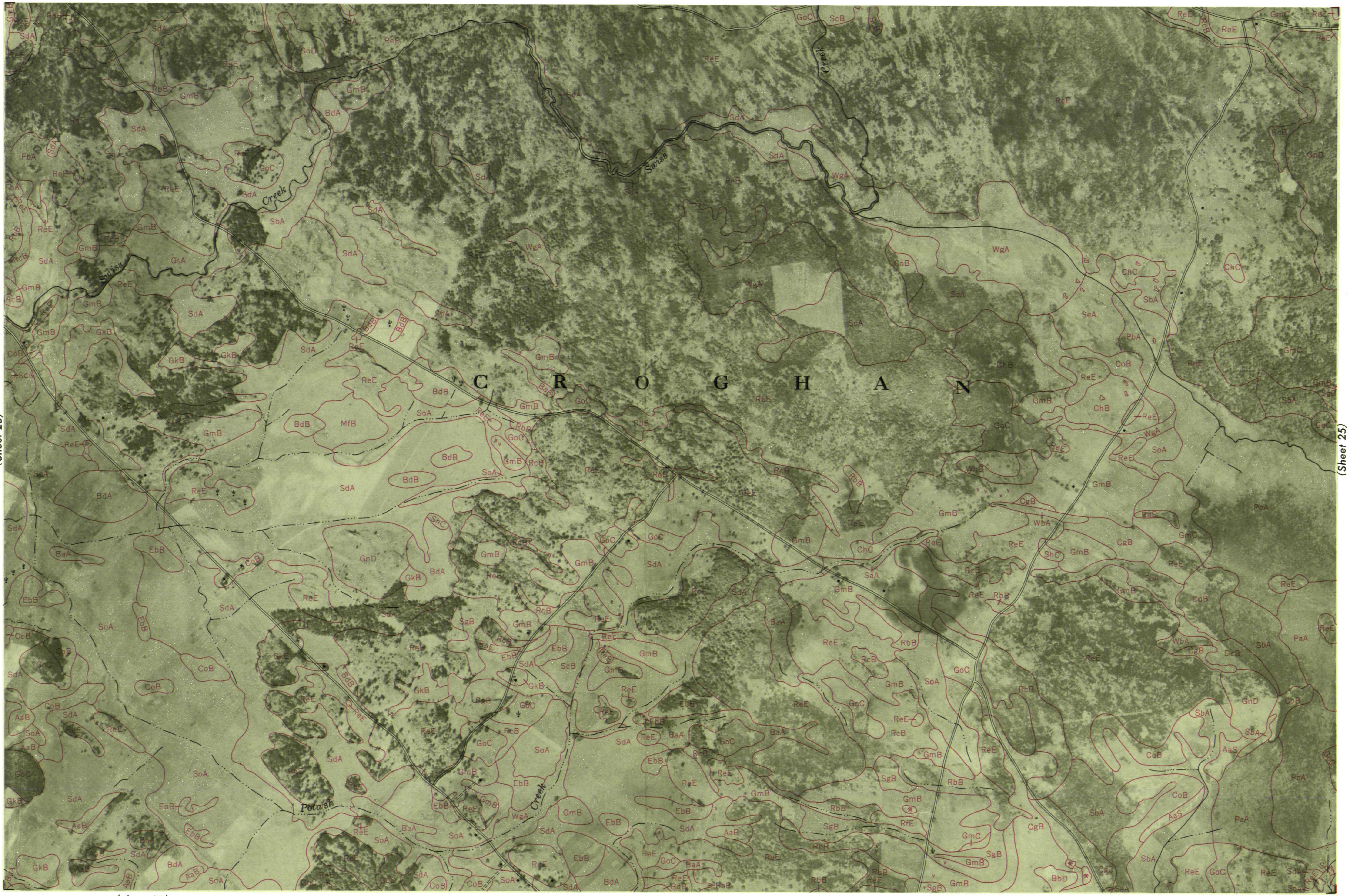

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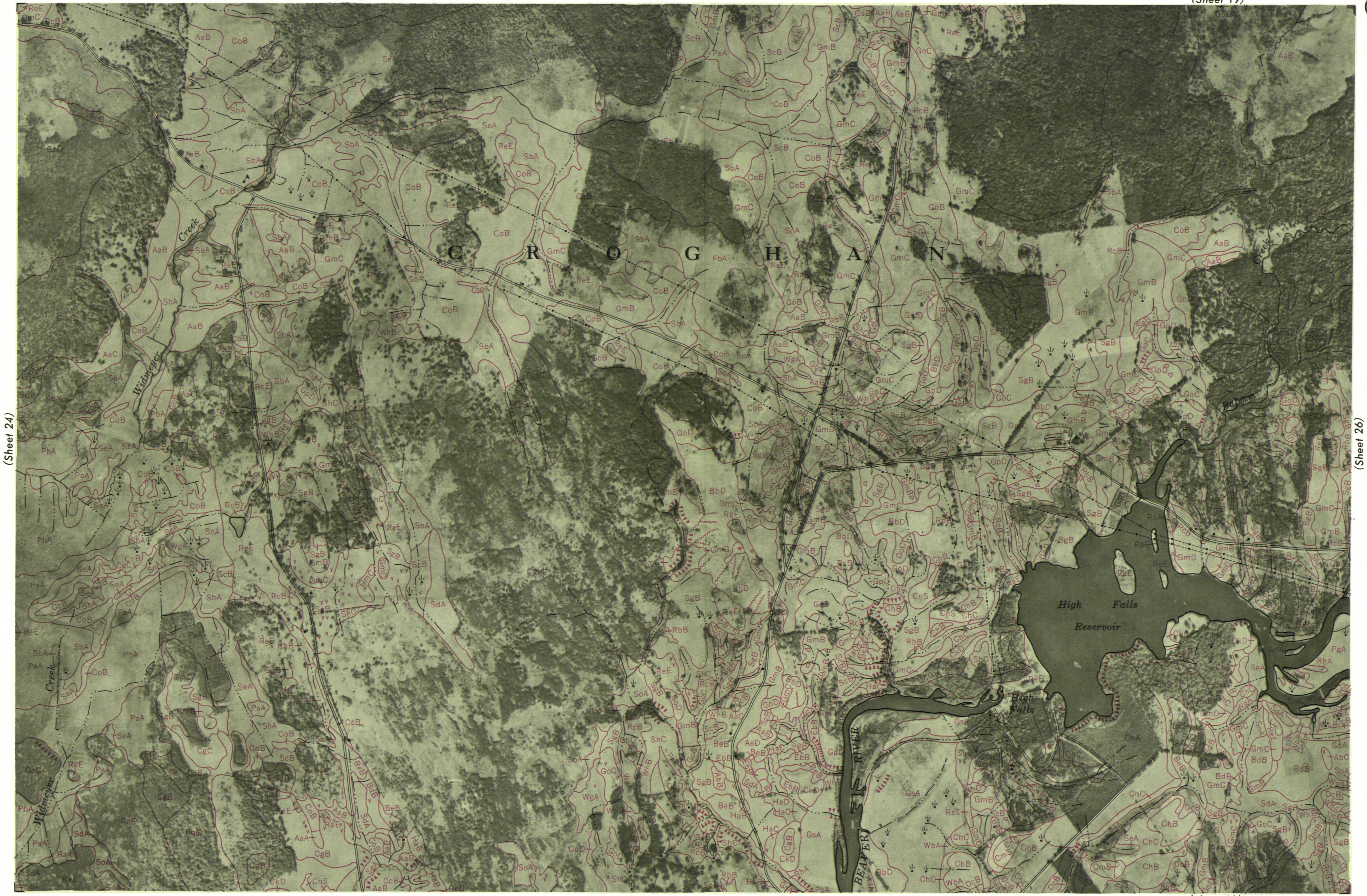

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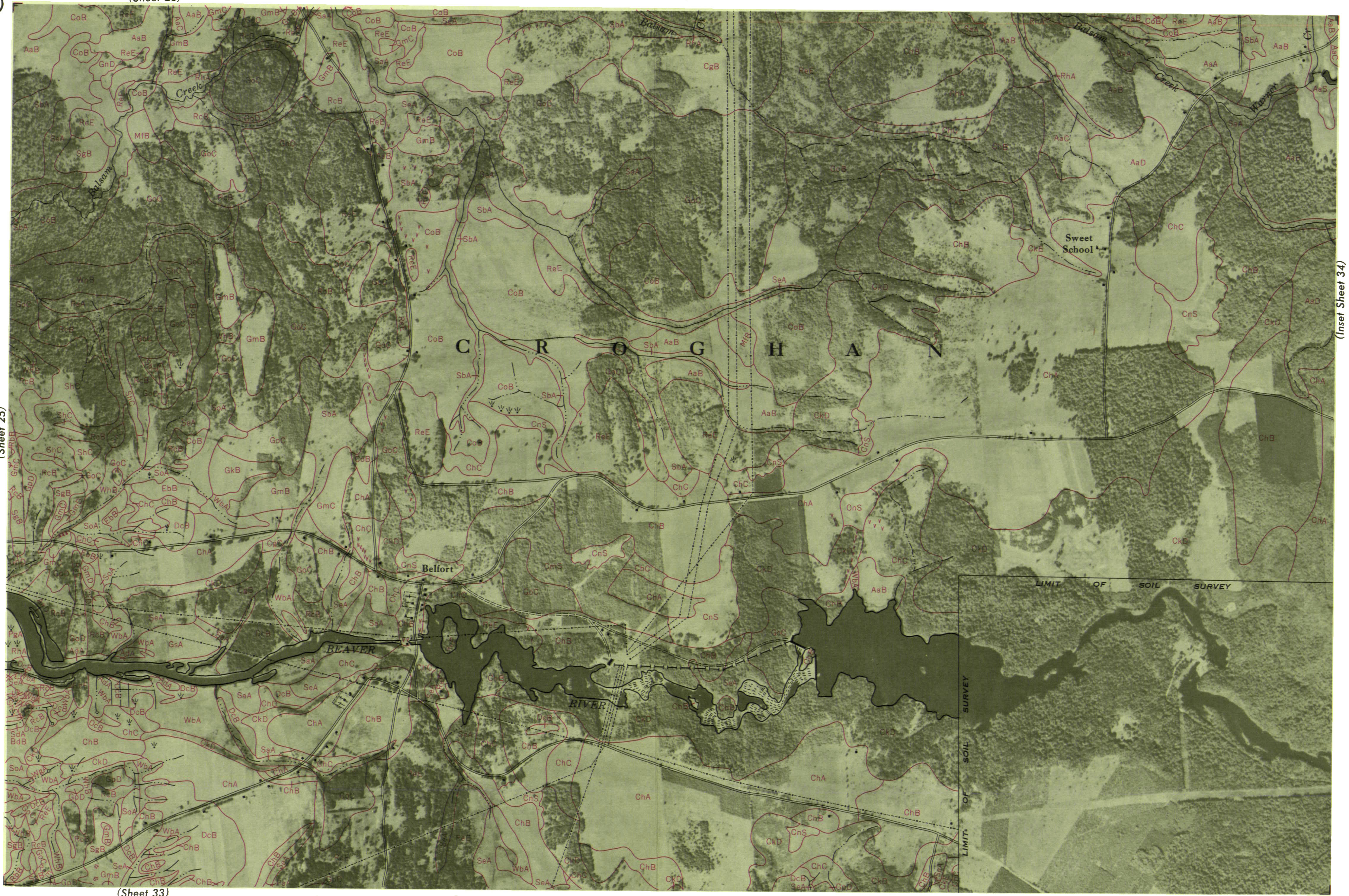

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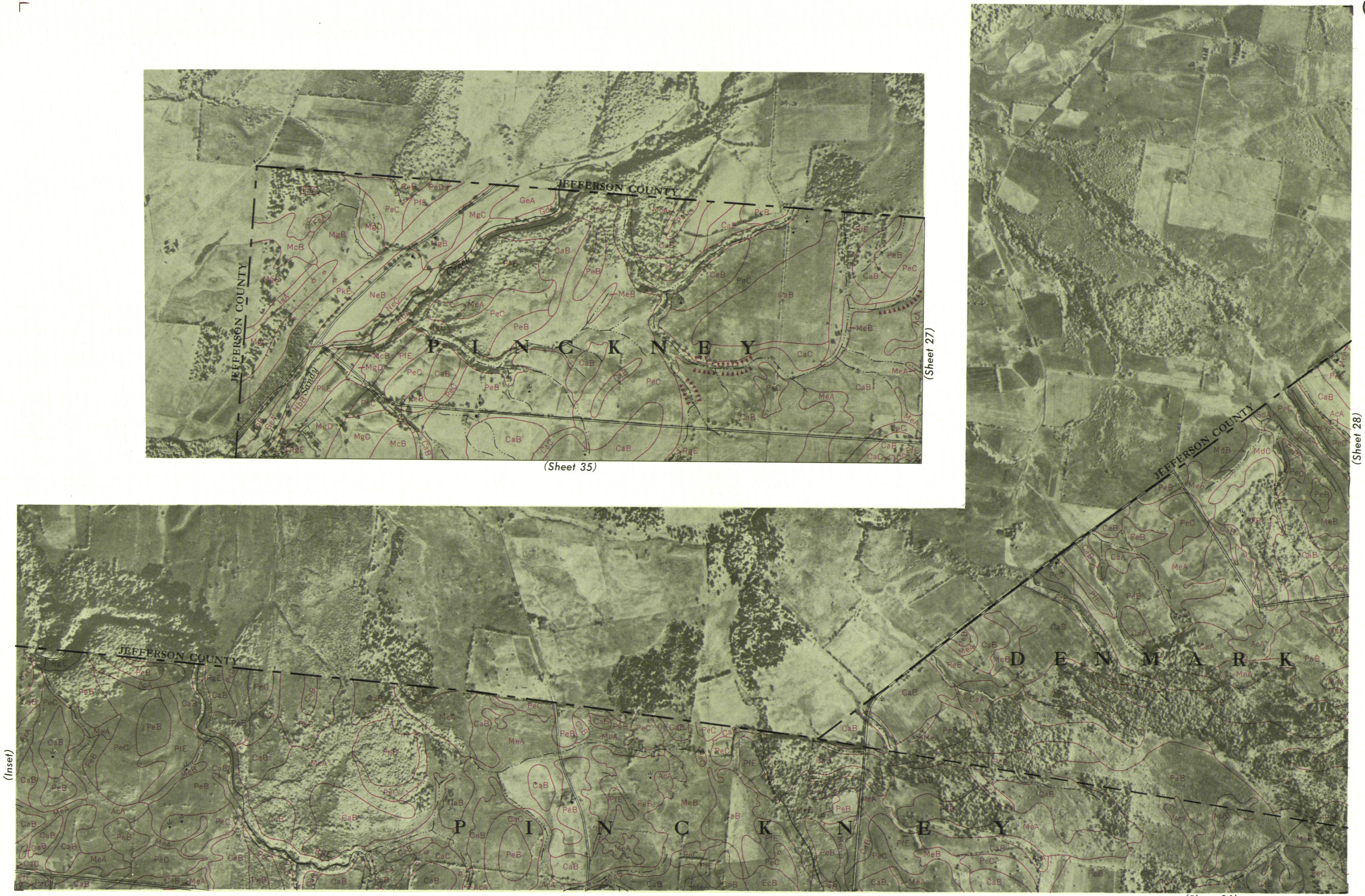

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0 1/2 1 Mile Scale 1:20000 0 5000 Feet

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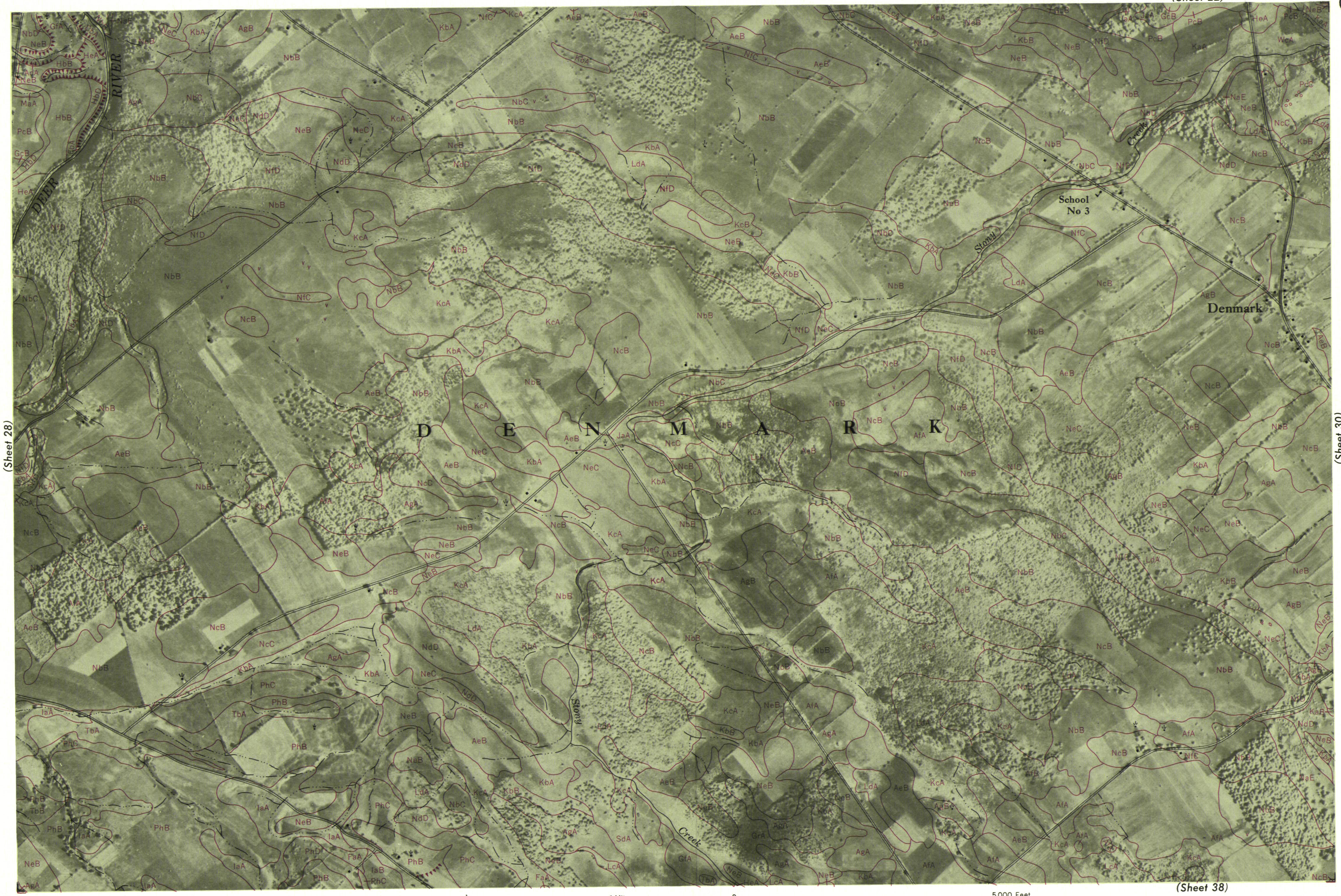

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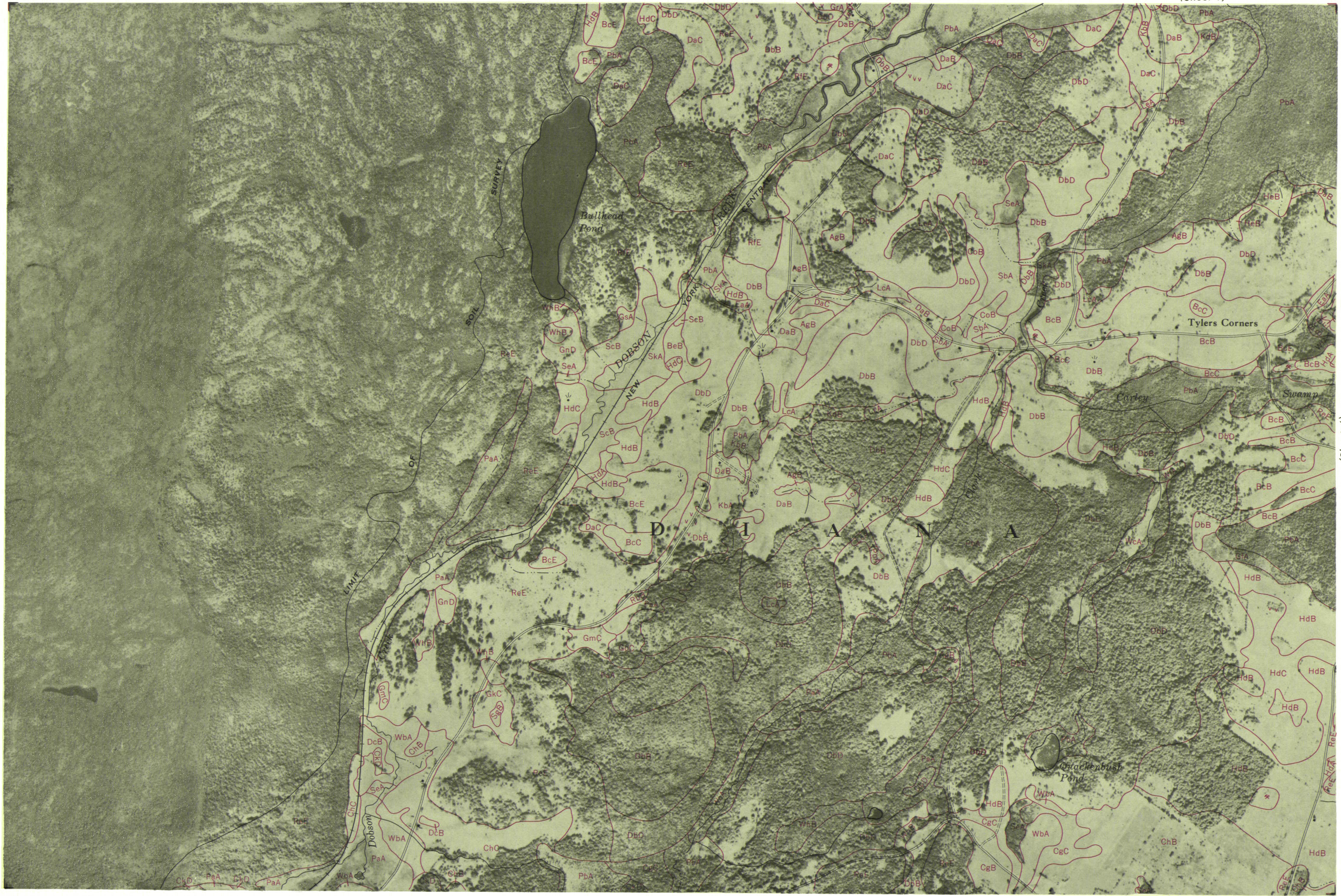

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0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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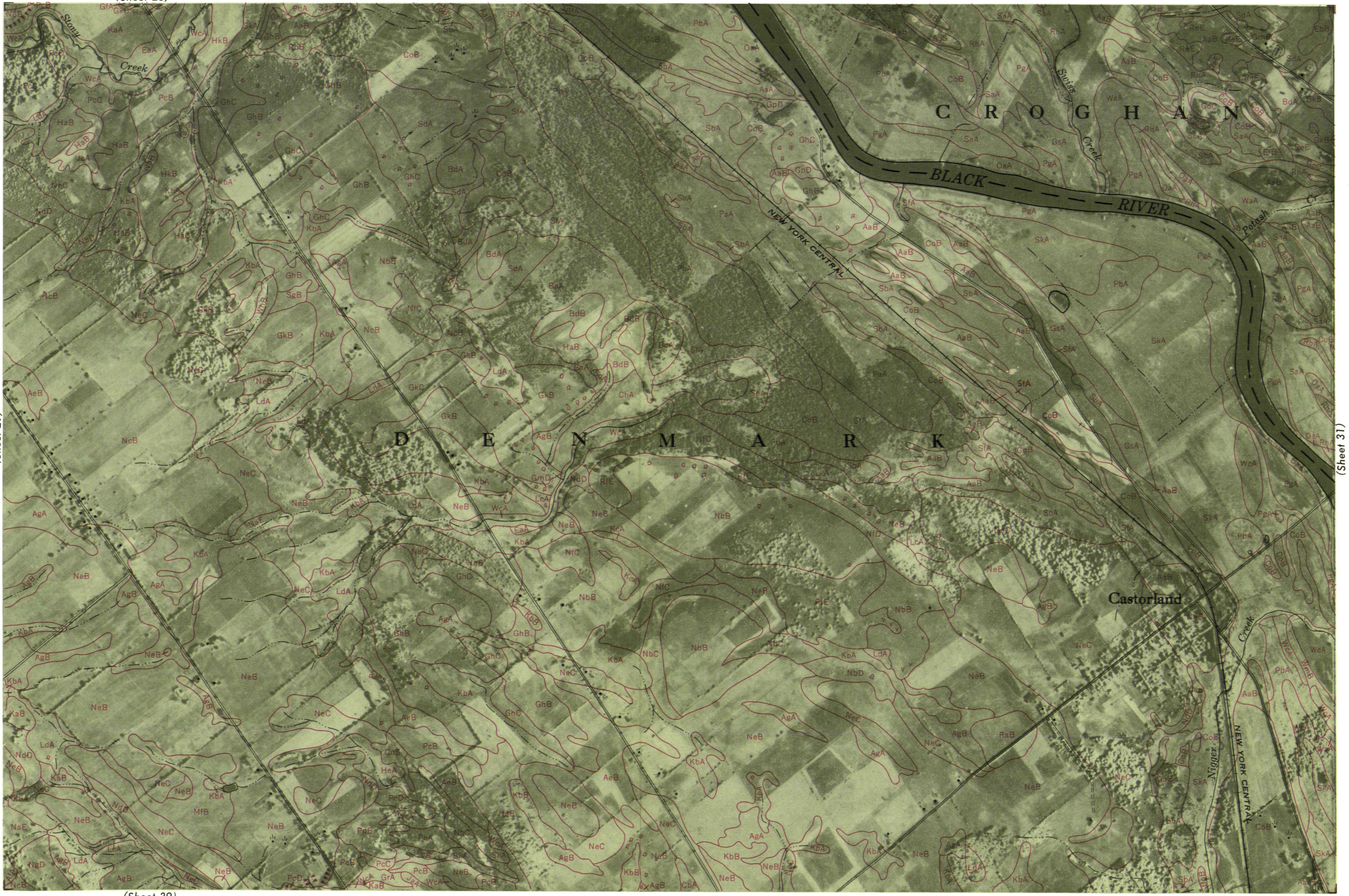

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(Sheet 25)

LEWIS COUNTY, NEW YORK

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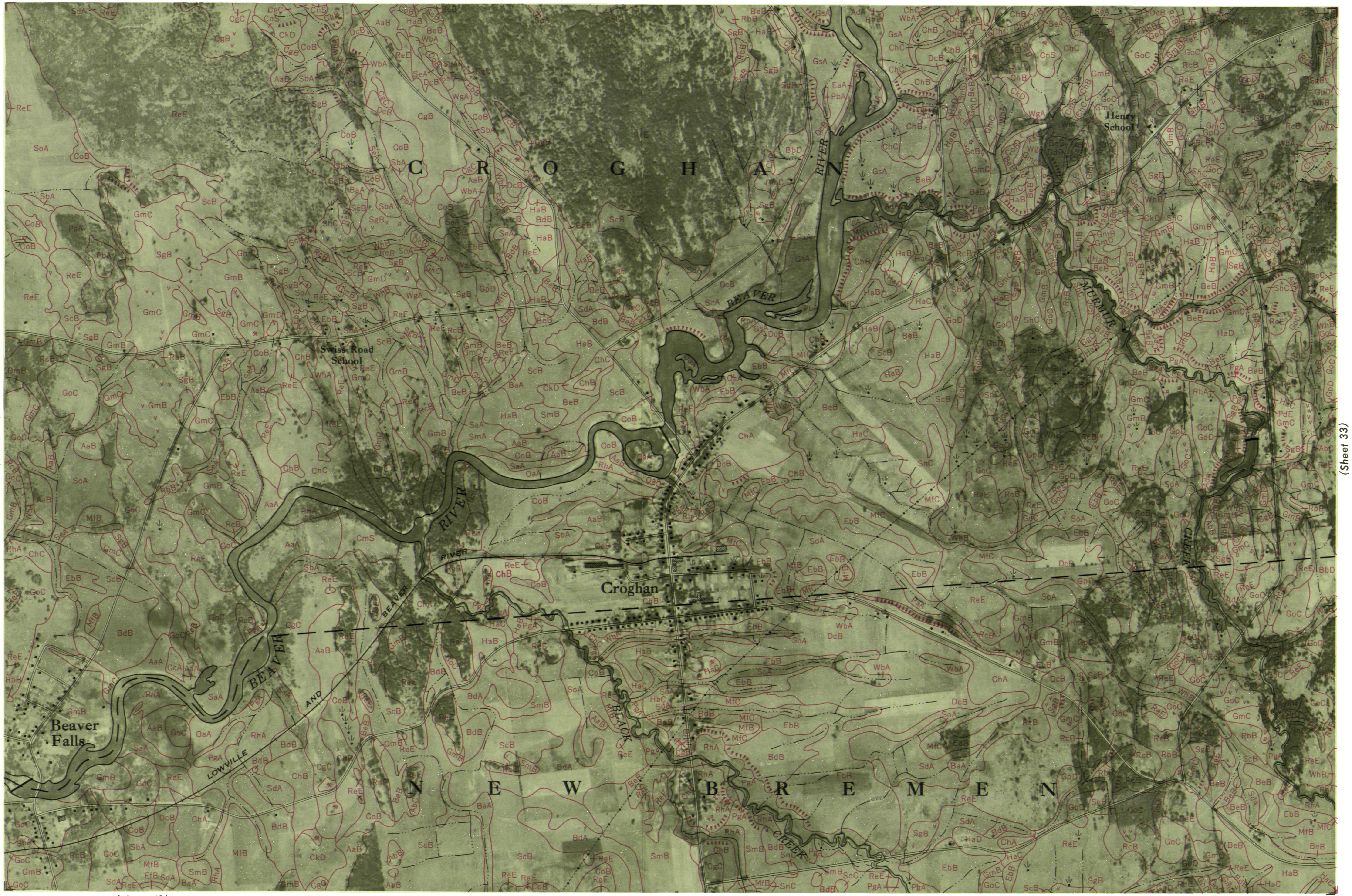

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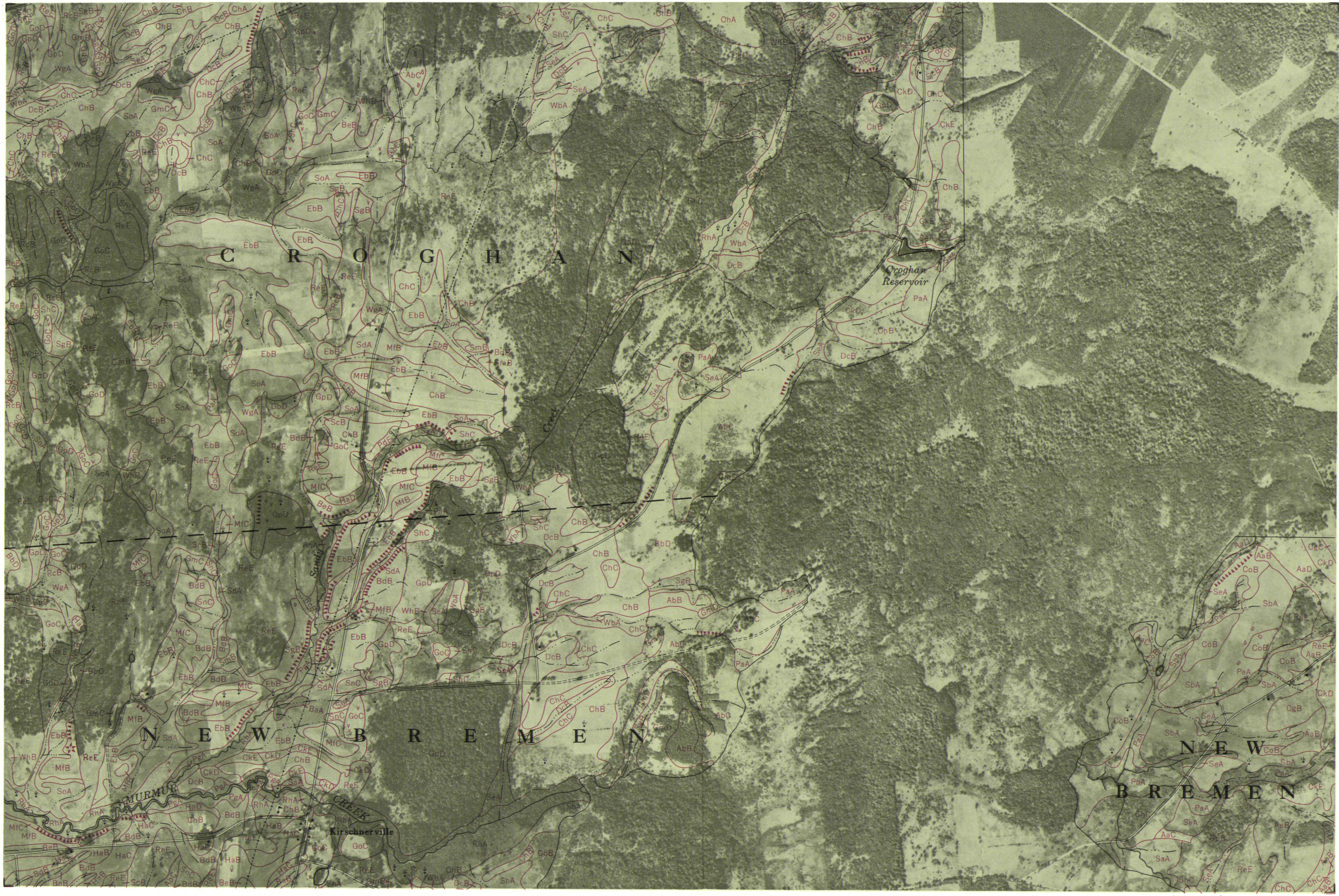

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0 1/2 1 Mile Scale 1:20 000 0 5000 Feet

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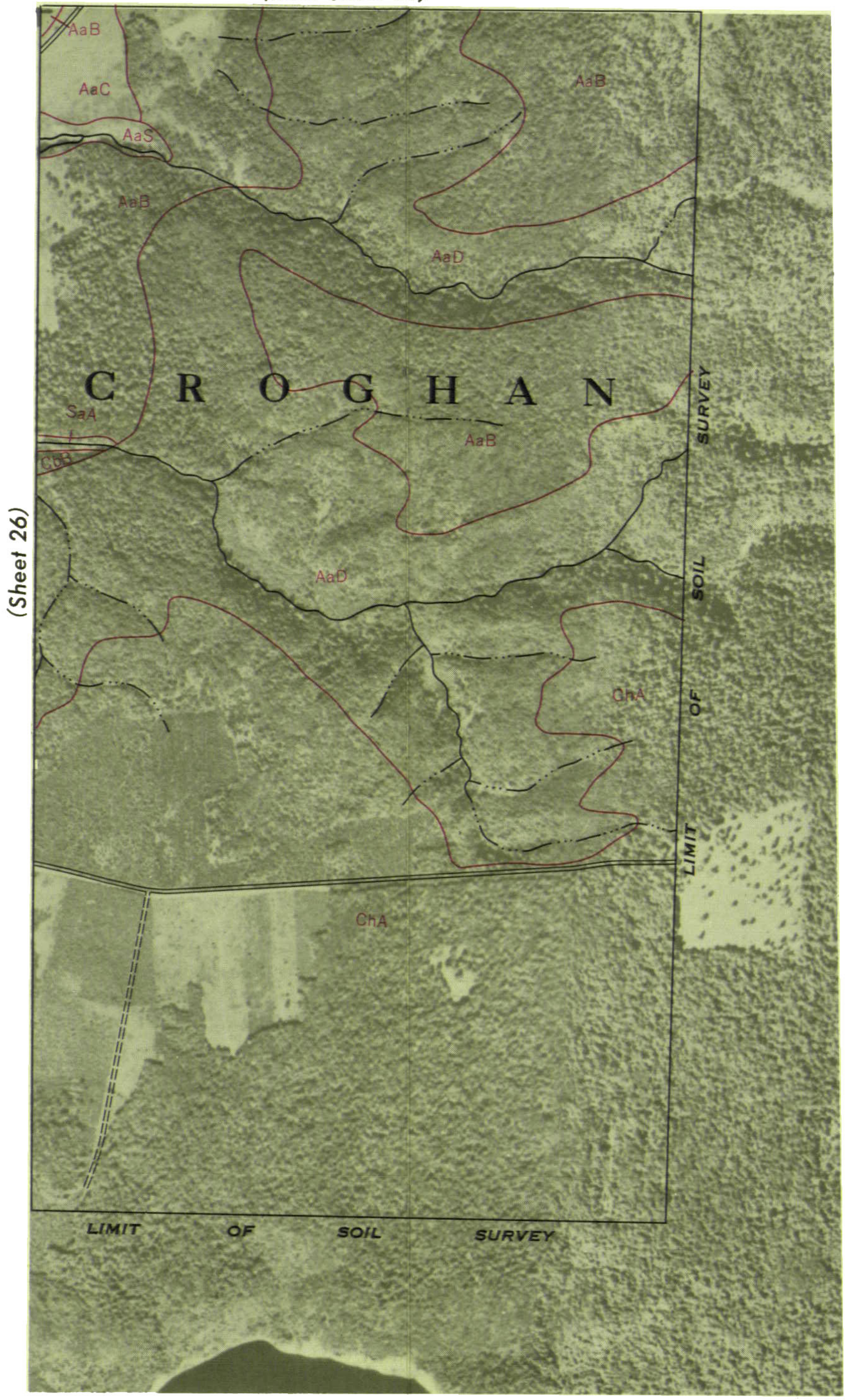

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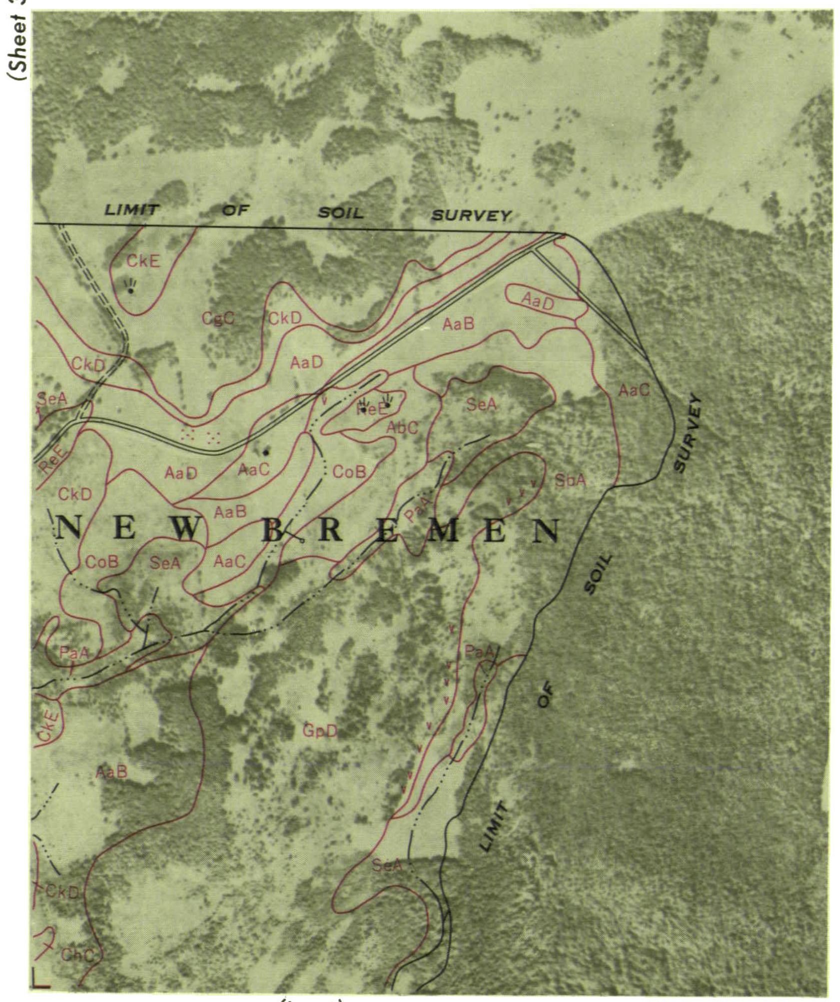

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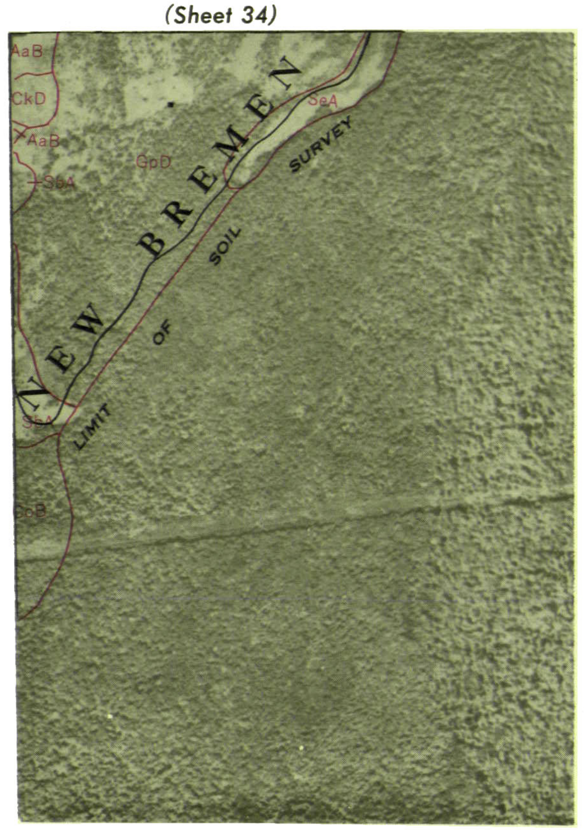

0 1/2 1 Mile

Scale 1:20 000

0 5000 Feet

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(Sheet 36)

(Sheet 43)

0 1/2 1 Mile Scale 1:20000 0 5000 Feet

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(Sheet 36)

(Sheet 38)

(Sheet 45)

0 1/2 1 Mile Scale 1:20000 0 5000 Feet

(Sheet 29)

LEWIS COUNTY, NEW YORK

N

(Sheet 37)

(Sheet 39)

(Sheet 46)

0 1/2 1 Mile

Scale 1:20000

0 5000 Feet

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(Sheet 38)

(Sheet 40)

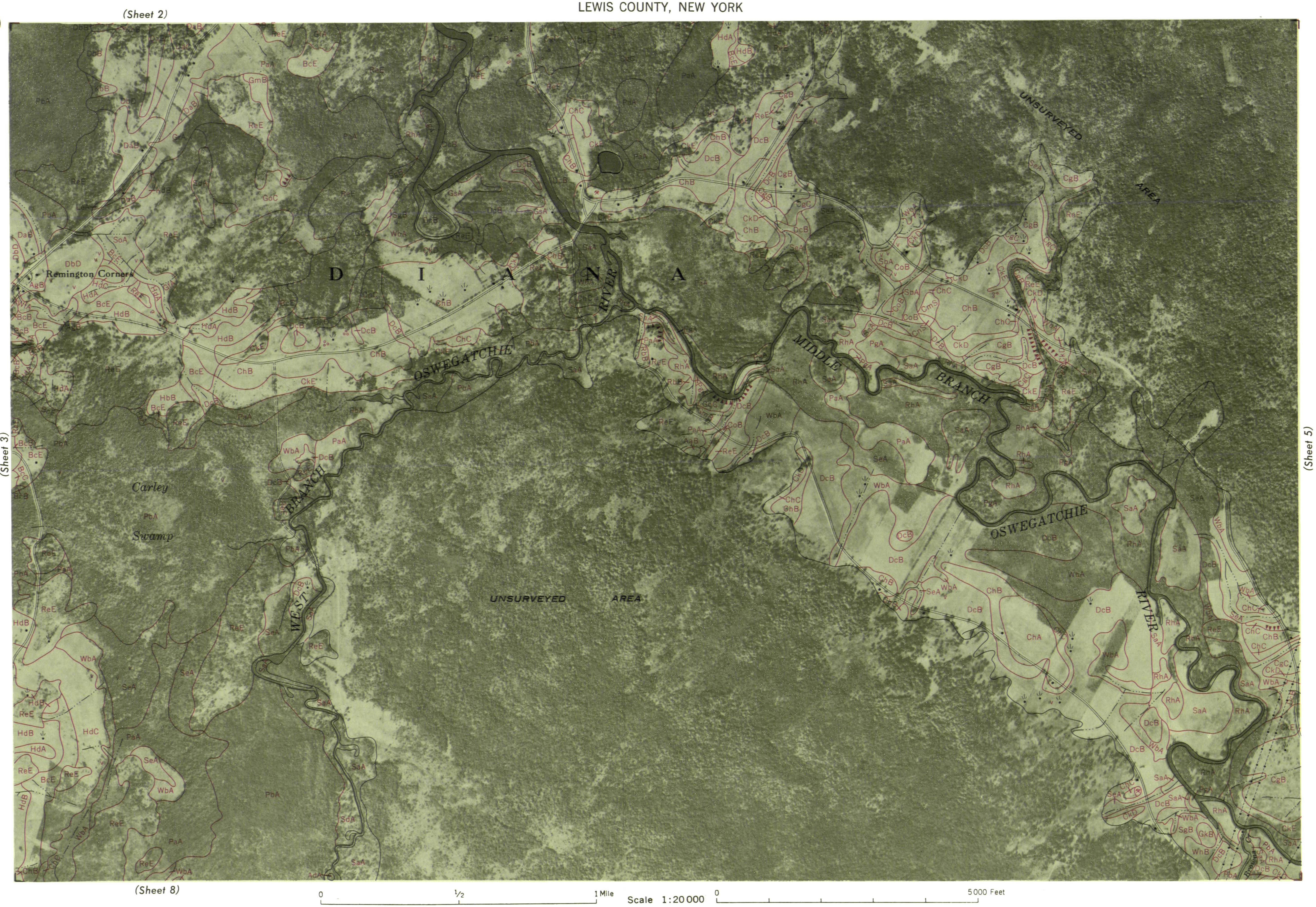
0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 47)

LEWIS COUNTY, NEW YORK



This is one of a set of maps prepared by the Soil Conservation Service, U. S. Department of Agriculture, for a soil survey report of this area. For information regarding the complete soil survey report, write the Soil Conservation Service, U. S. Department of Agriculture, Washington 25, D. C. This map compiled from aerial photographs flown in 1943, 1944, 1948, 1949.

(Sheet 31)

LEWIS COUNTY, NEW YORK

(Sheet 39)

(Sheet 41)

(Sheet 48)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

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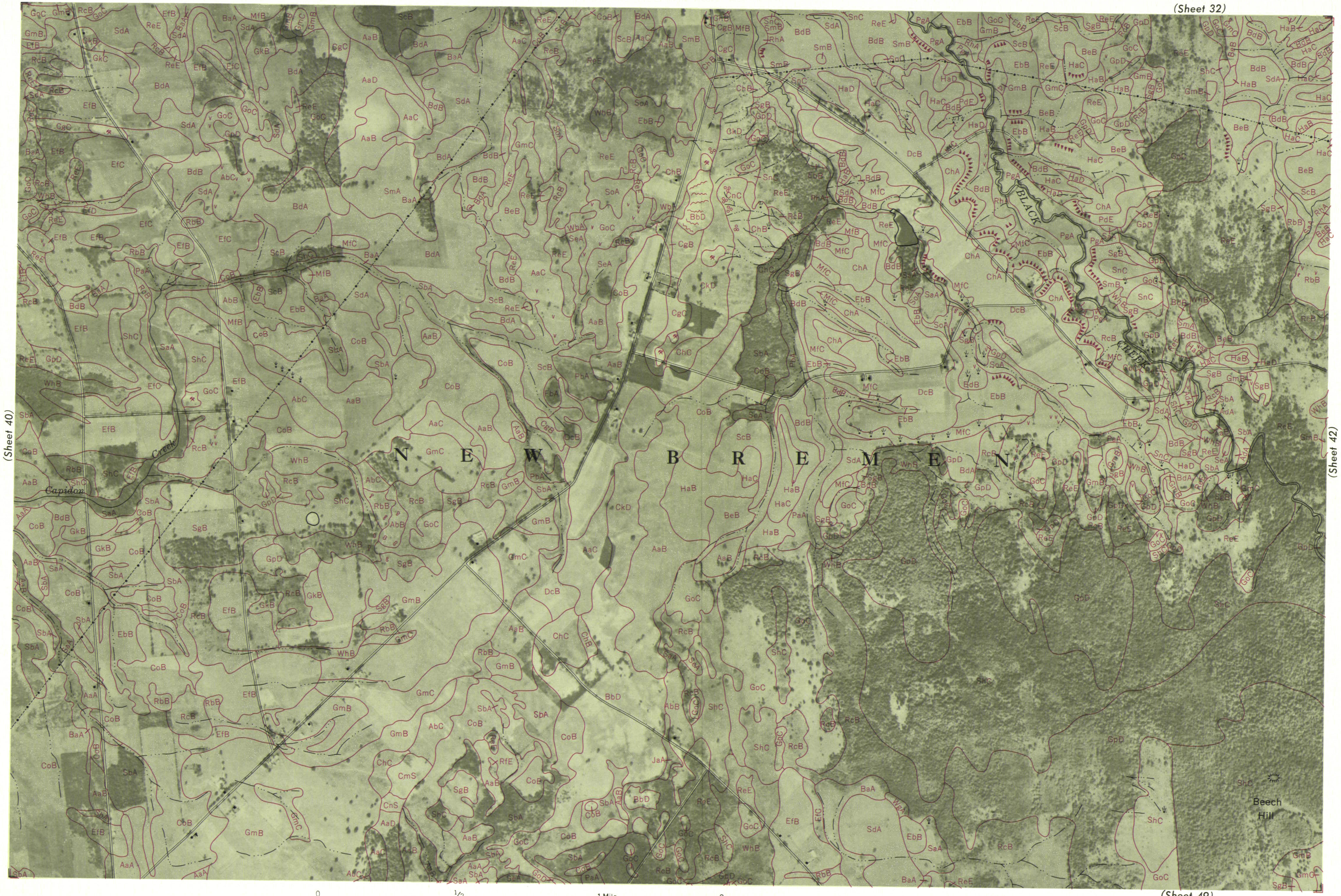

0 1/2 1 Mile Scale 1:20 000 0 5000 Feet

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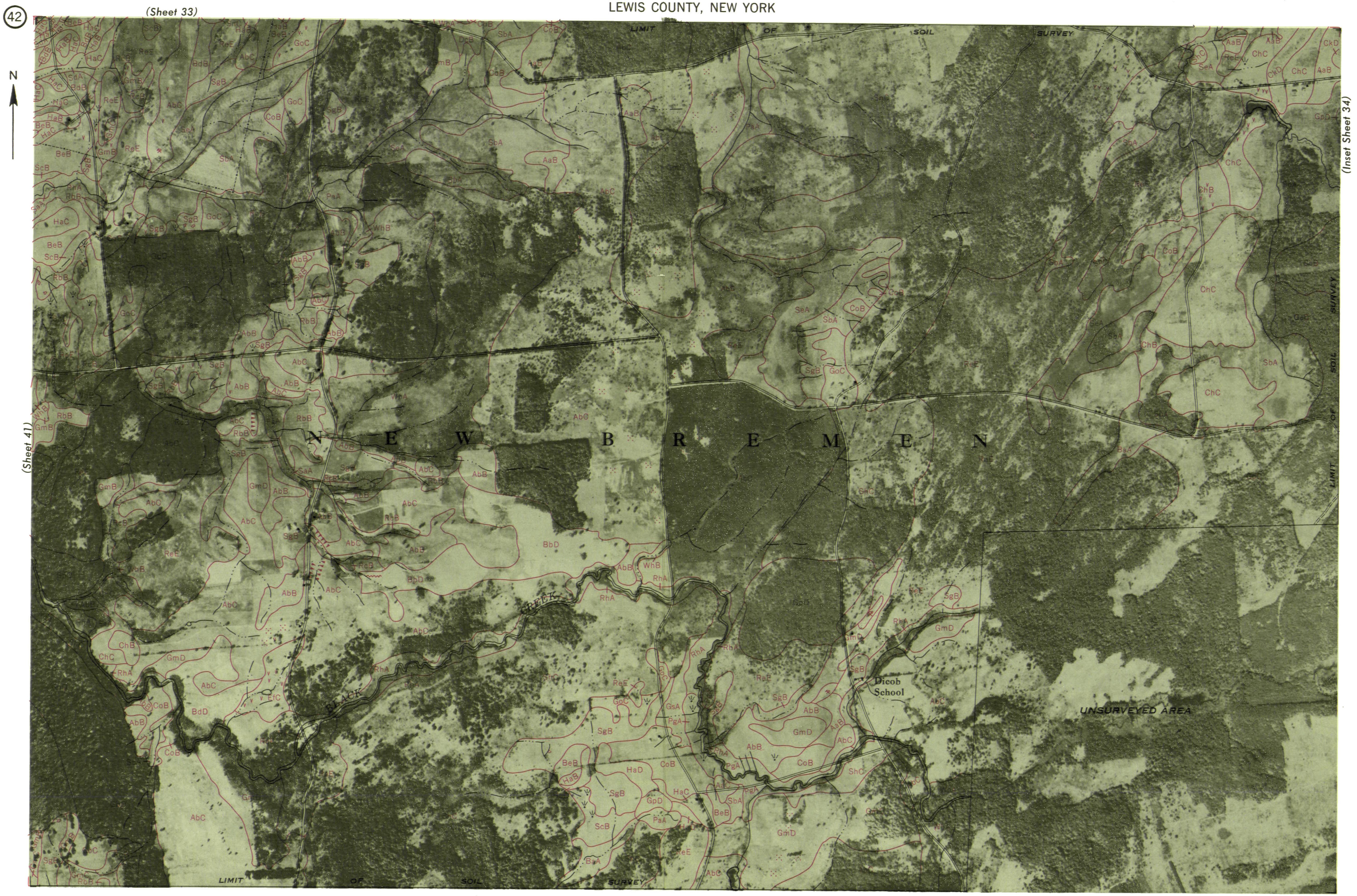
LEWIS COUNTY, NEW YORK



0 1/2 1 Mile Scale 1:20000 0 5000 Feet

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0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

LEWIS COUNTY, NEW YORK

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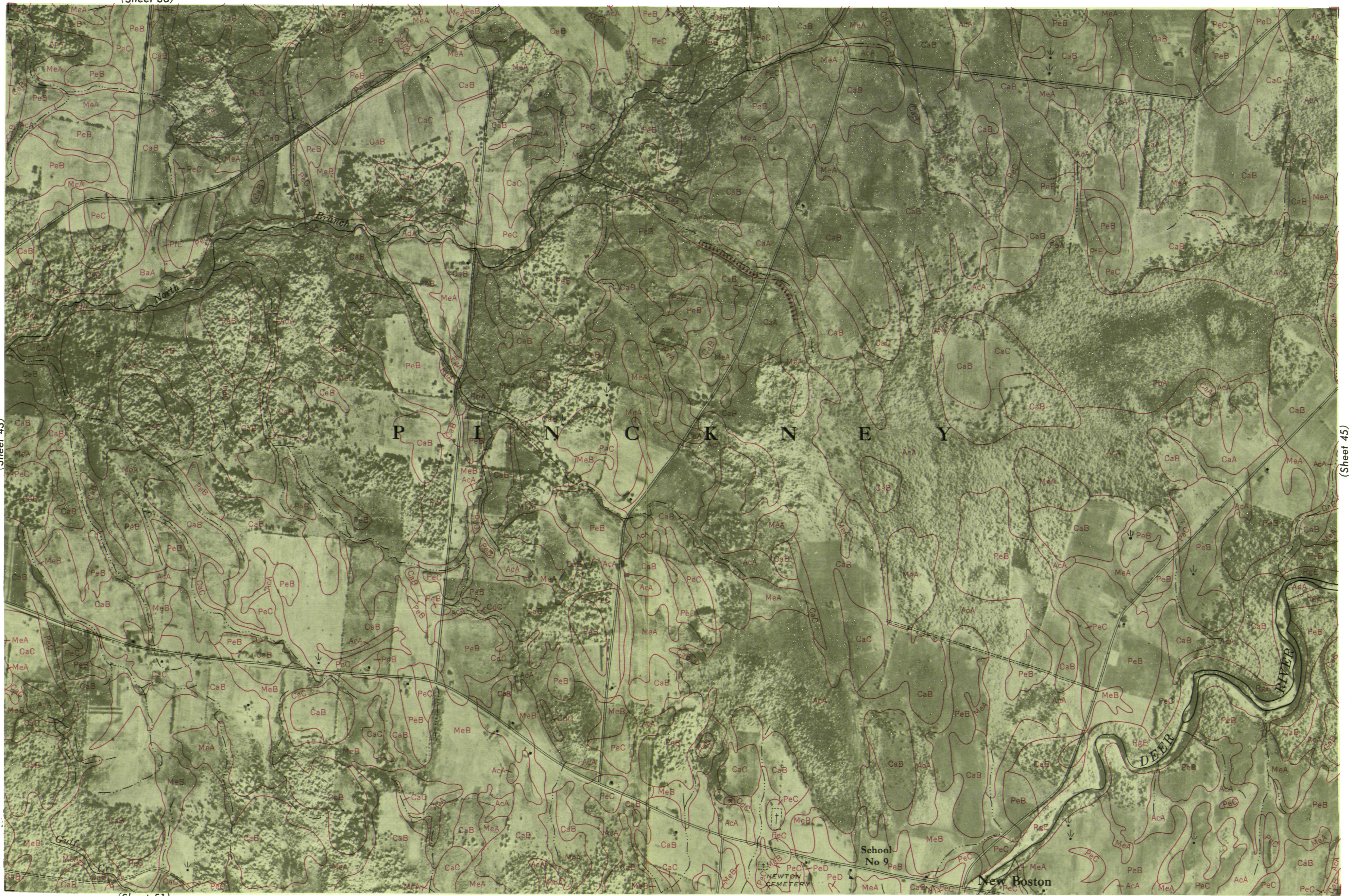

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(Sheet 51)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

This is one of a set of maps prepared by the Soil Conservation Service, U. S. Department of Agriculture, for a soil survey report of this area. For information regarding the complete soil survey report, write the Soil Conservation Service, U. S. Department of Agriculture, Washington 25, D. C. This map compiled from aerial photographs flown in 1943, 1944, 1948, 1949.

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0 1/2 1 Mile Scale 1:20000 0 5000 Feet

LEWIS COUNTY, NEW YORK

(Sheet 38)

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(Sheet 53)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

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Scale 1:20 000

0 — 1/2 — 1 Mile

0 — 5000 Feet

(Sheet 40)

(Sheet 47)

(Sheet 49)

(Sheet 55)

0 1/2 1 Mile Scale 1:20 000 0 5000 Feet

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0 1/2 1 Mile Scale 1:20 000 0 5000 Feet

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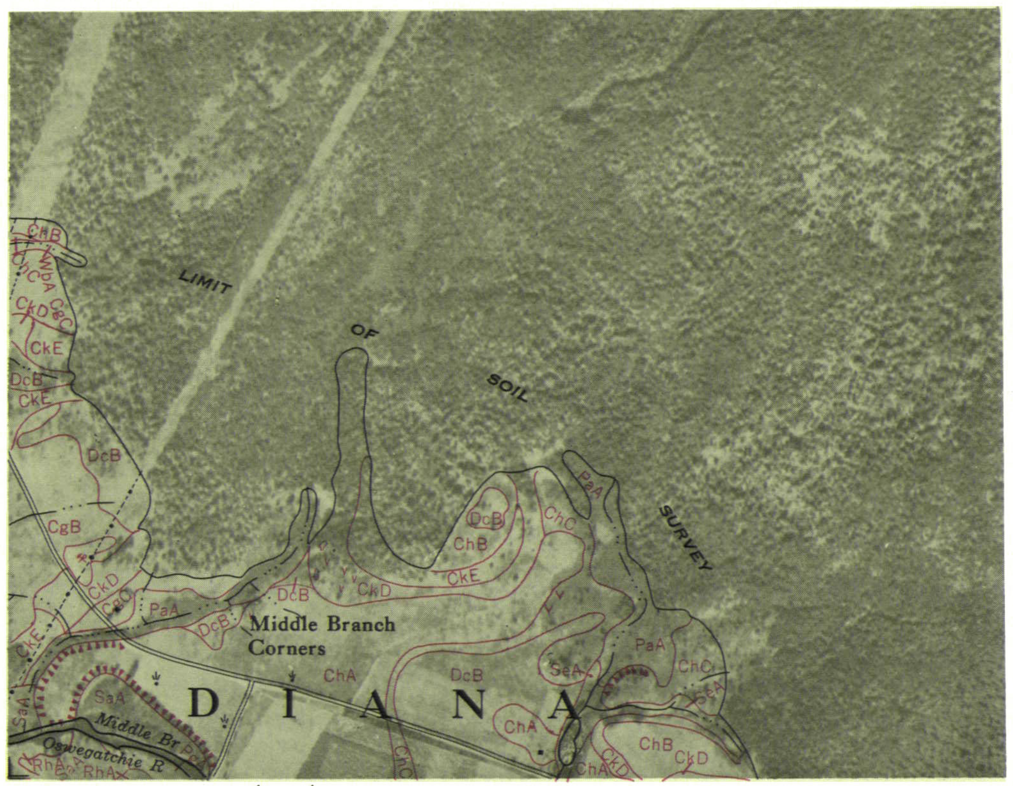

(Inset)

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

N

(Sheet 51)

0 1/2 1 Mile Scale 1:20000 0 5000 Feet

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0 1/2 1 Mile Scale 1:20000 0 5000 Feet

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0 1/2 1 Mile Scale 1:20000 0 5000 Feet

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(Sheet 52)

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0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

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LEWIS COUNTY, NEW YORK

(Sheet 47)

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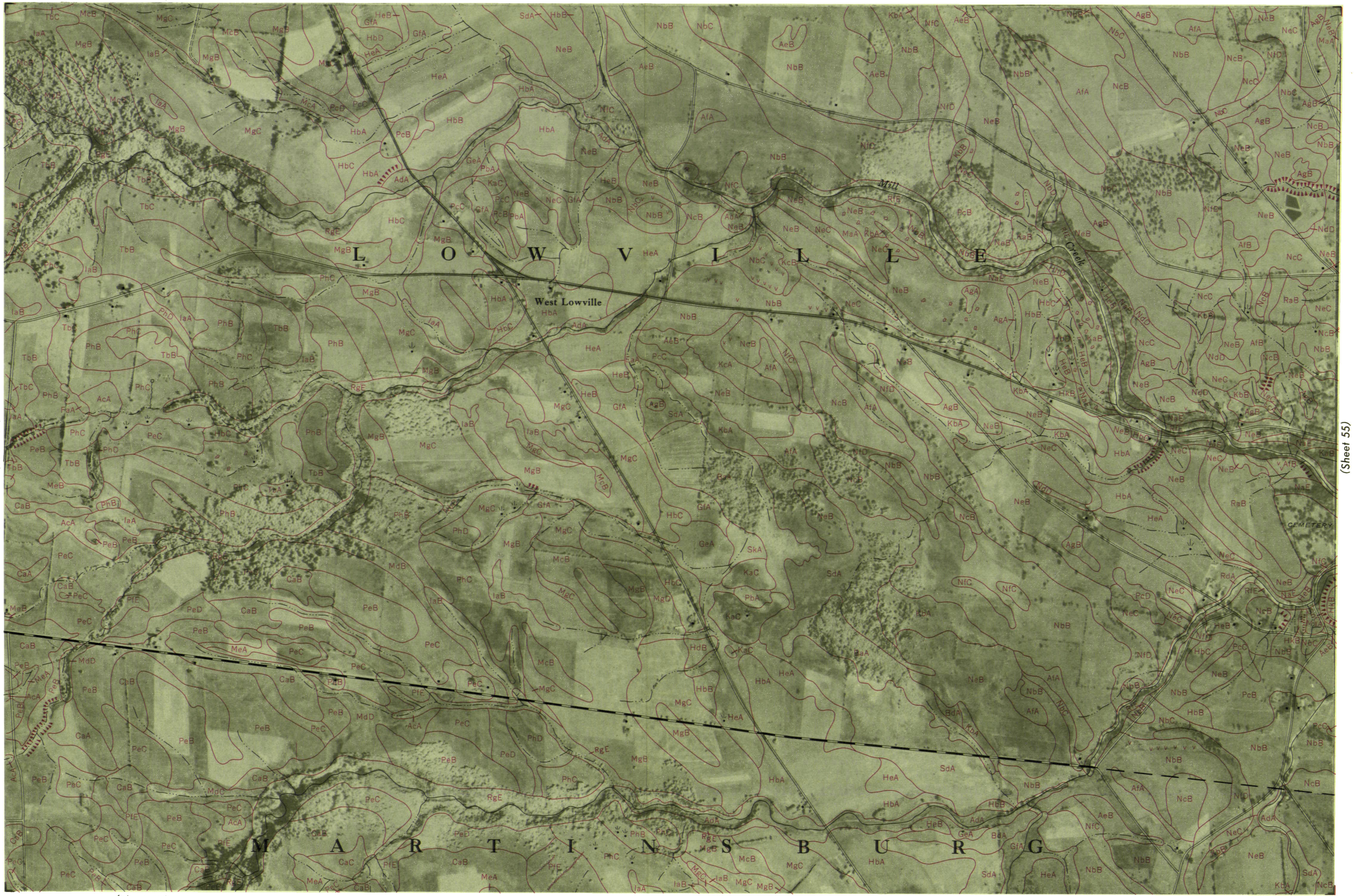

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0 1/2 1 Mile Scale 1:20000 0 5000 Feet

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0 1/2 1 Mile Scale 1:20000 0 5000 Feet

LEWIS COUNTY, NEW YORK

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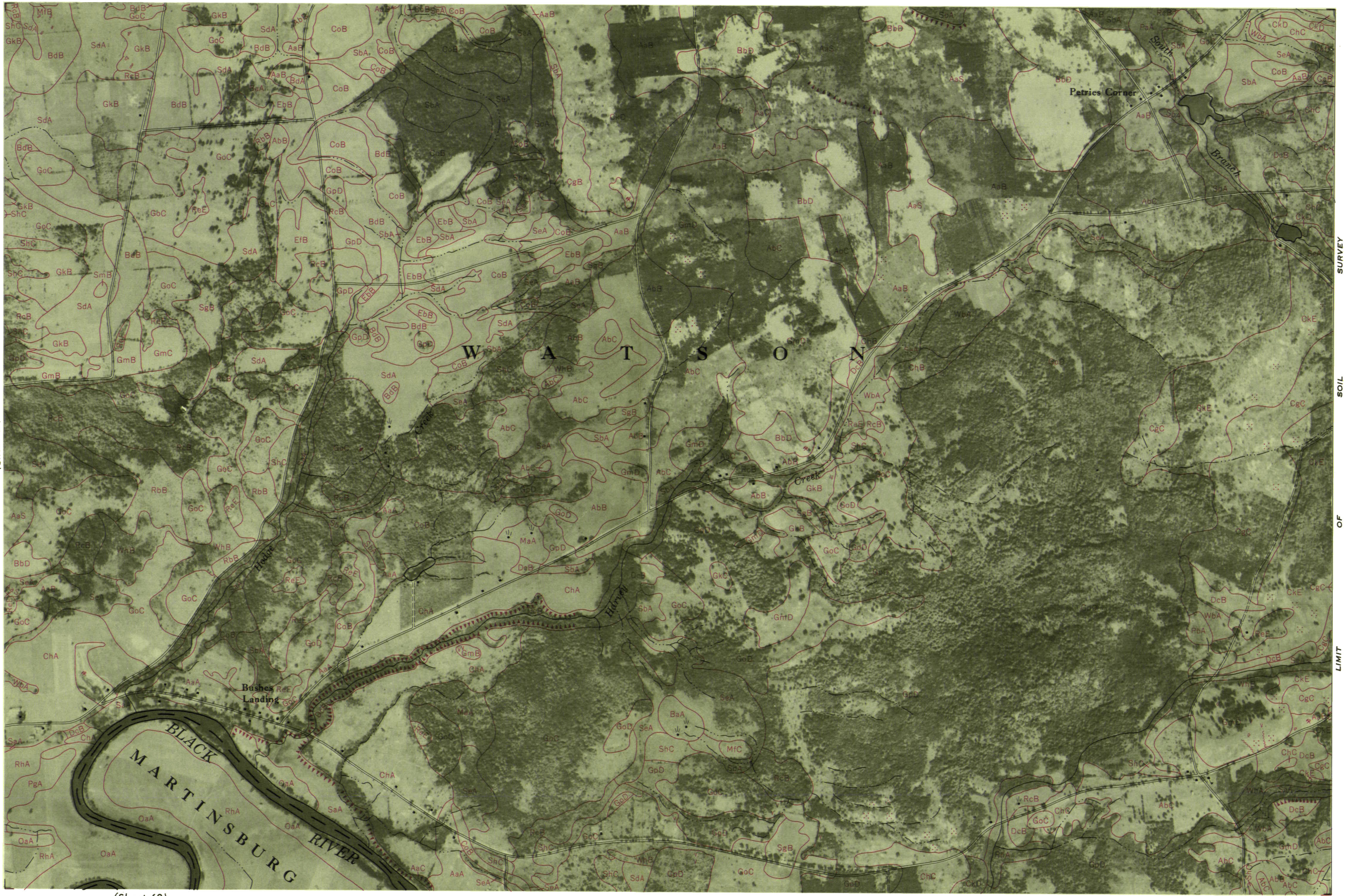

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0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

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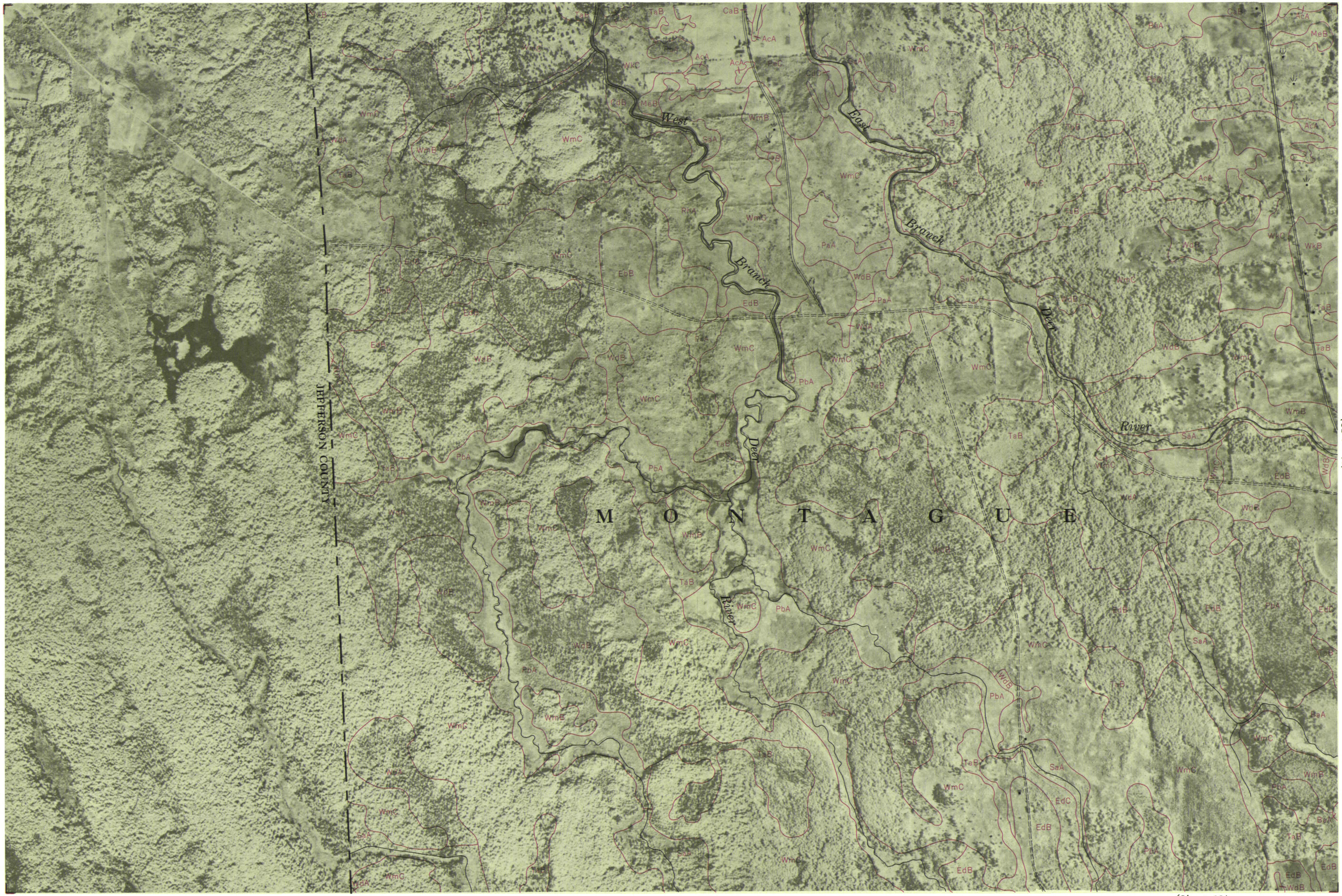

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0 ½ 1 Mile Scale 1:20000 0 5000 Feet

LEWIS COUNTY, NEW YORK

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0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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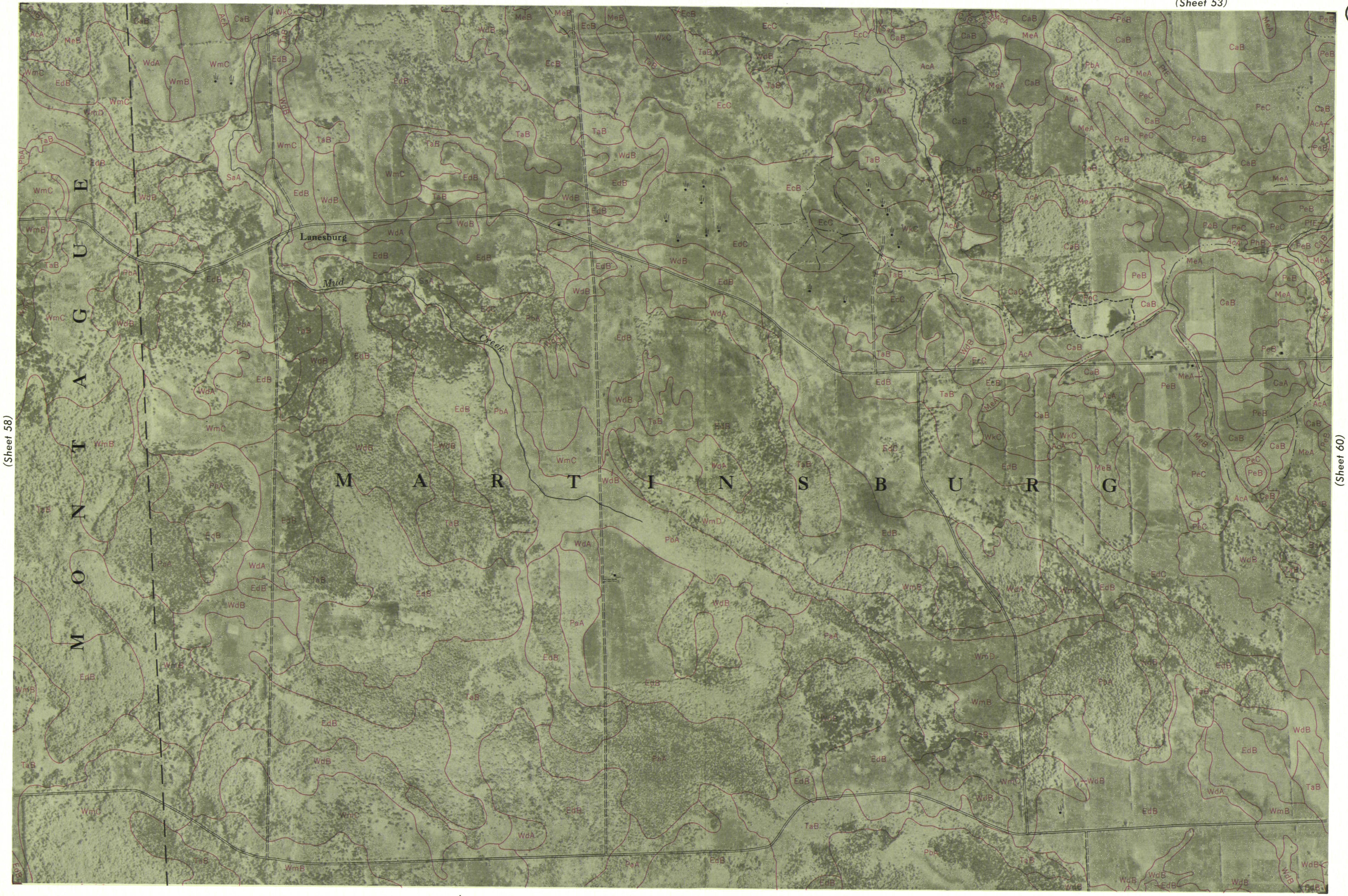

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0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

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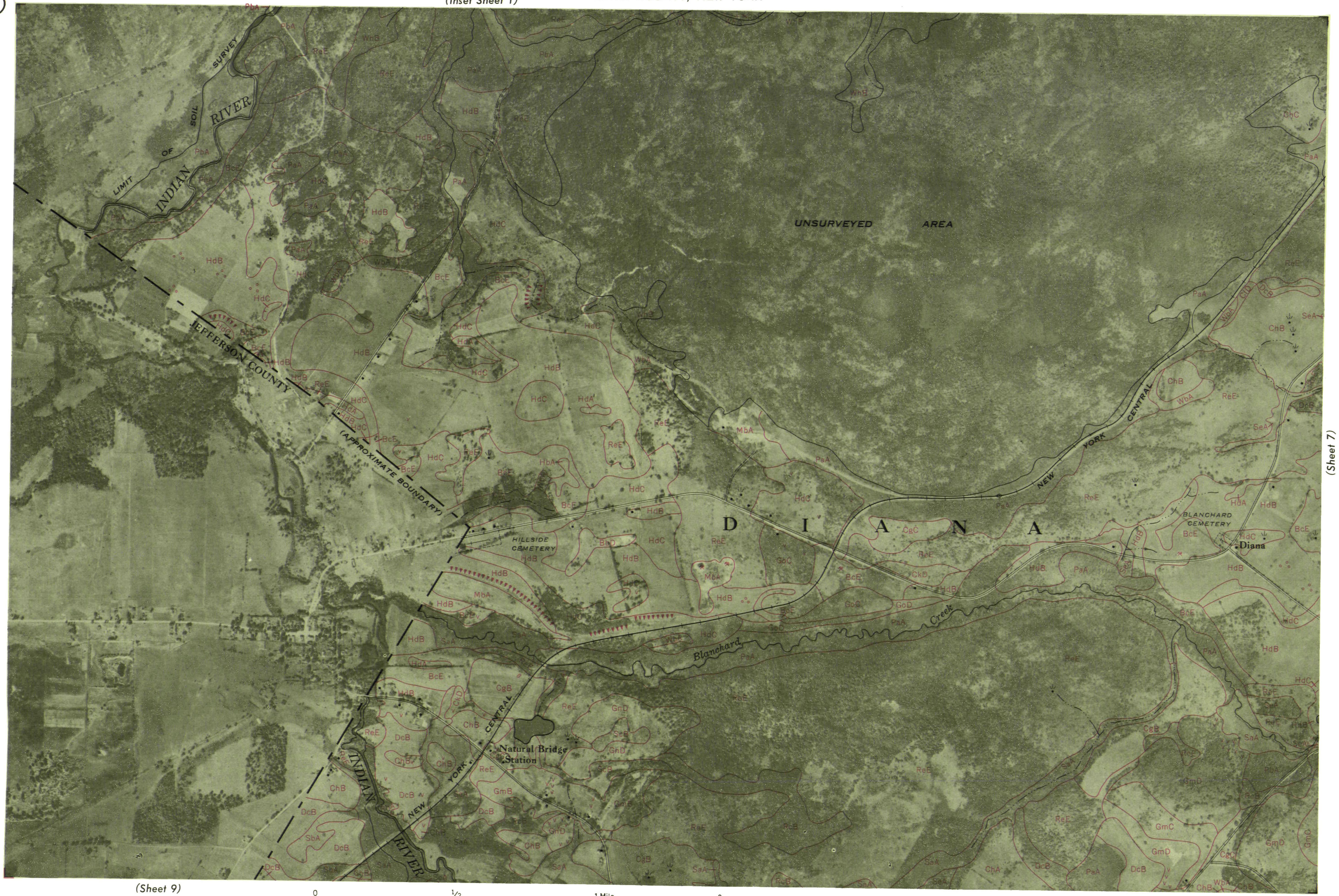

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0 1/2 1 Mile Scale 1:20000 0 5000 Feet

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0 ½ 1 Mile Scale 1:20000 0 5000 Feet

LEWIS COUNTY, NEW YORK

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(Sheet 61)

(Sheet 68)

0 1/2 1 Mile Scale 1:20 000 0 5000 Feet

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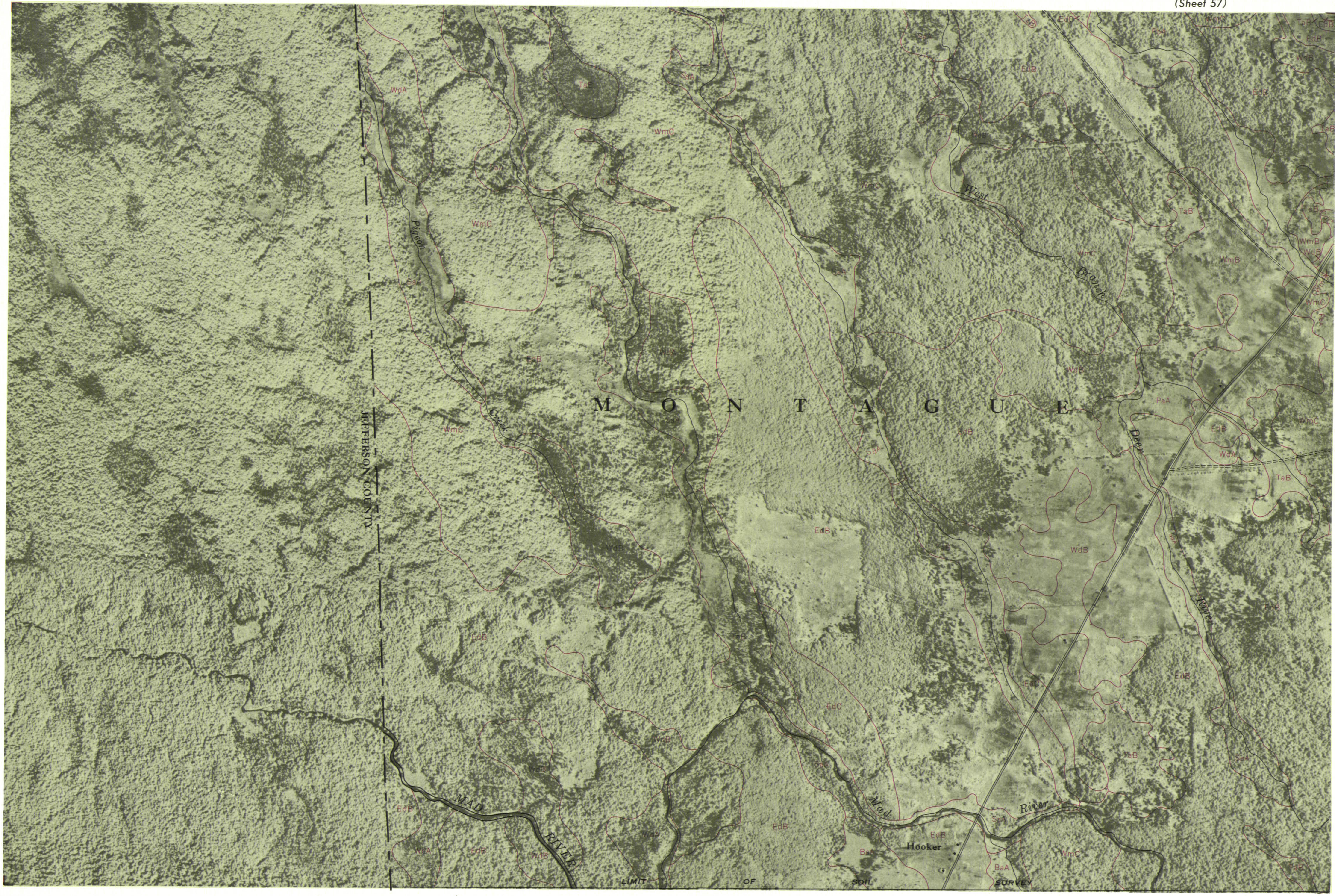

(Sheet 64)

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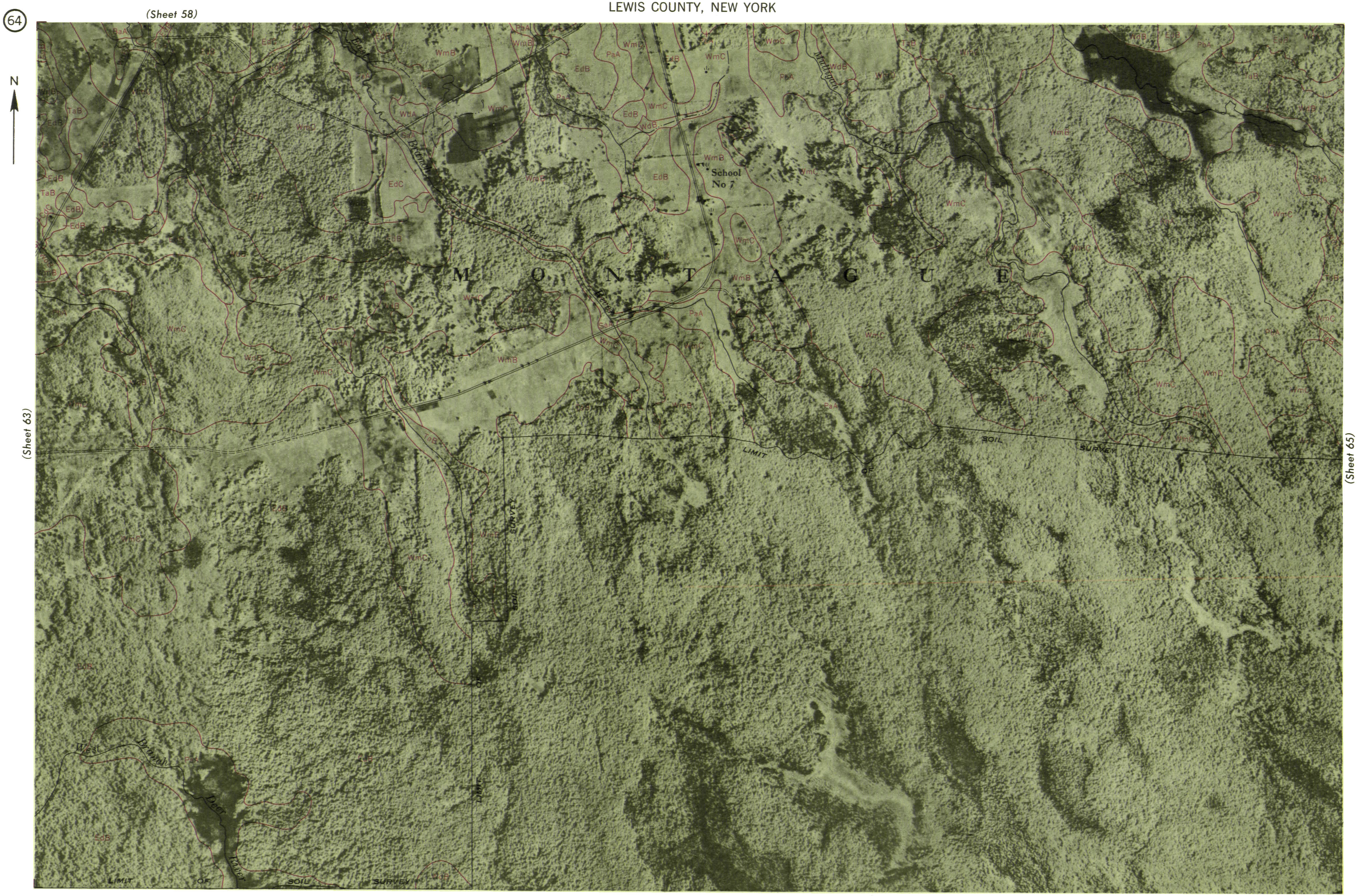

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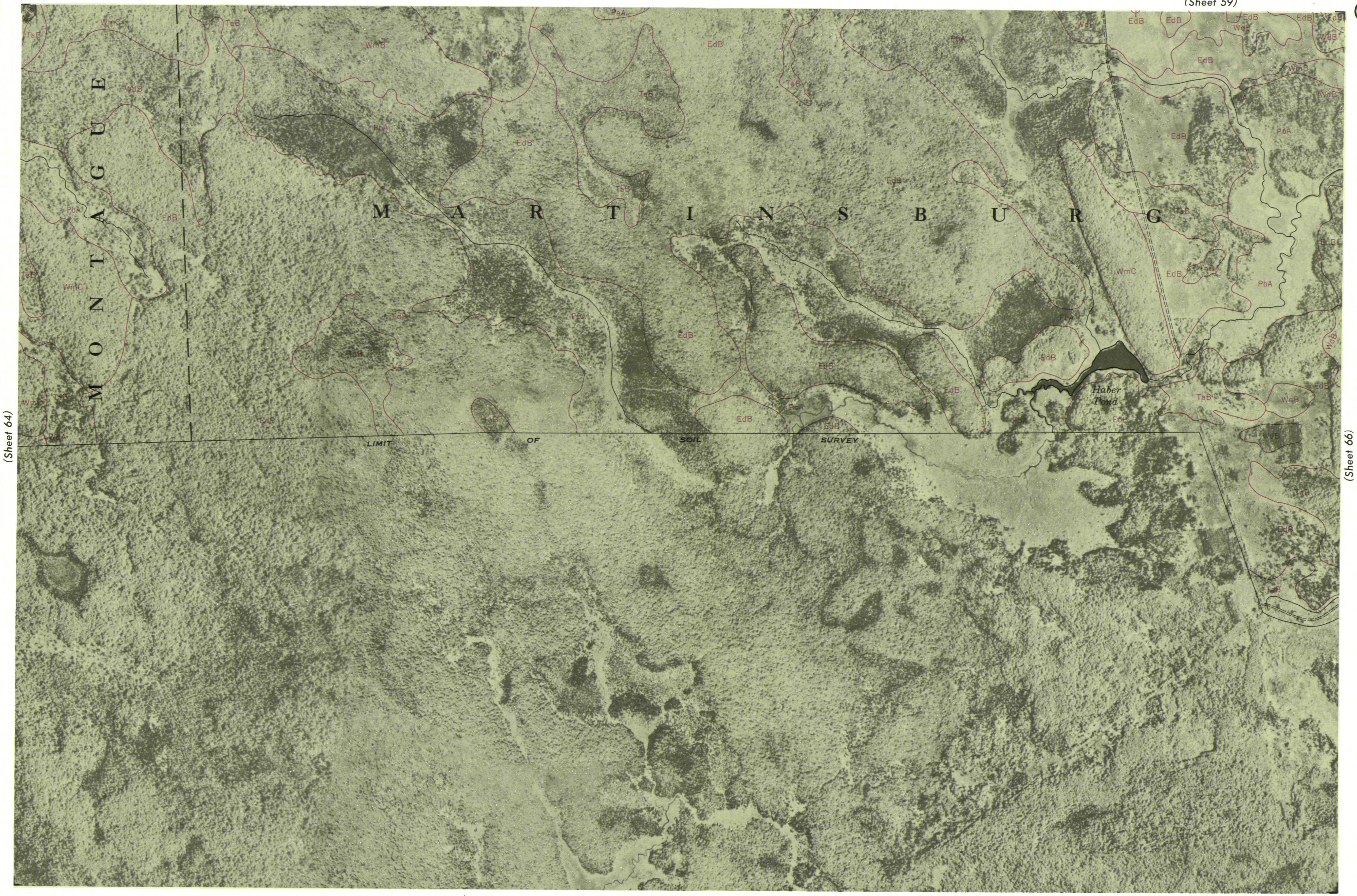

0 1/2 1 Mile Scale 1:20000 0 5000 Feet

LEWIS COUNTY, NEW YORK

(Sheet 60)

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(Sheet 67)

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0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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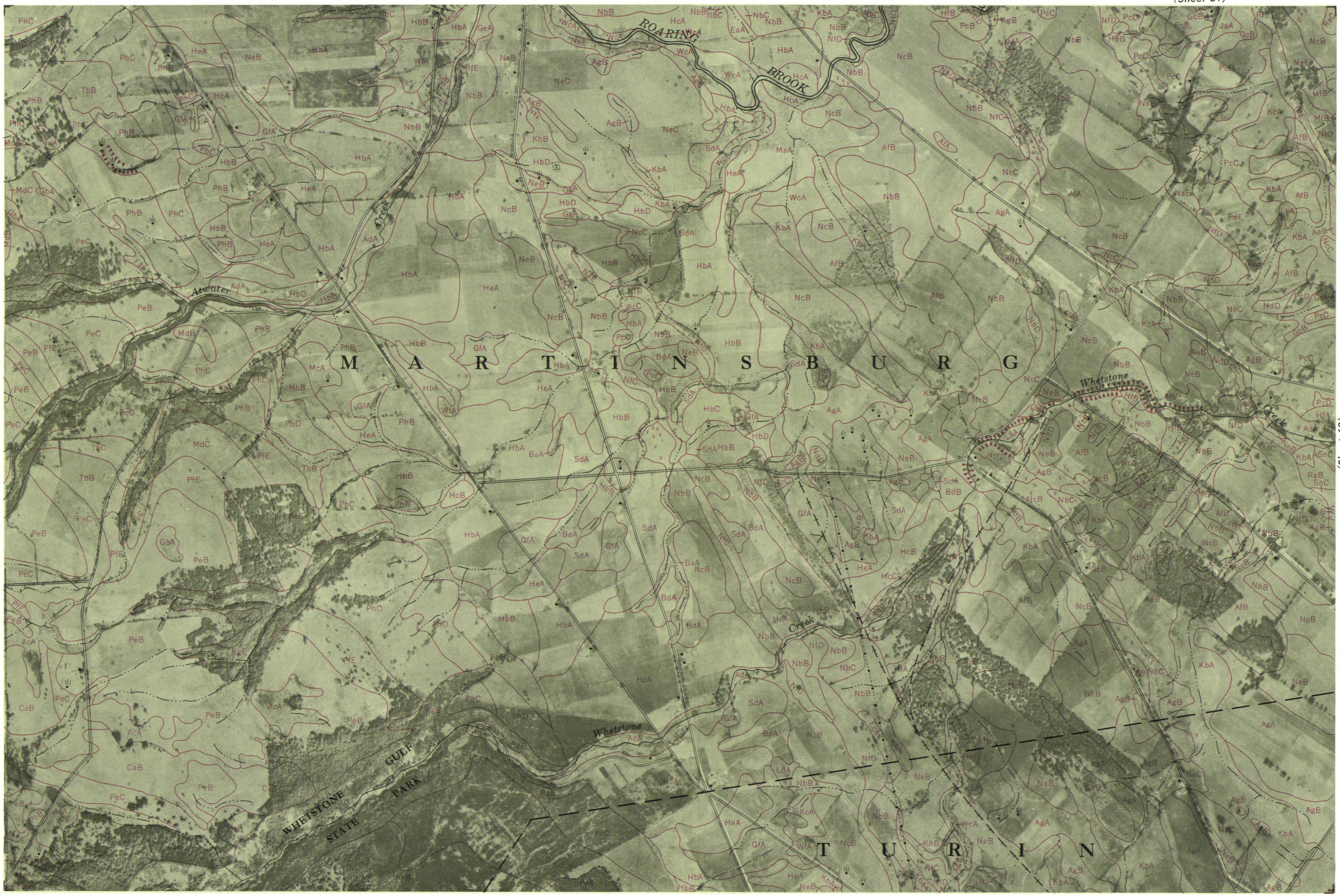

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0 1/2 1 Mile Scale 1:20 000 0 5000 Feet

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(Sheet 62)

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(Sheet 71)

0 1/2 1 Mile Scale 1:20000 0 5000 Feet

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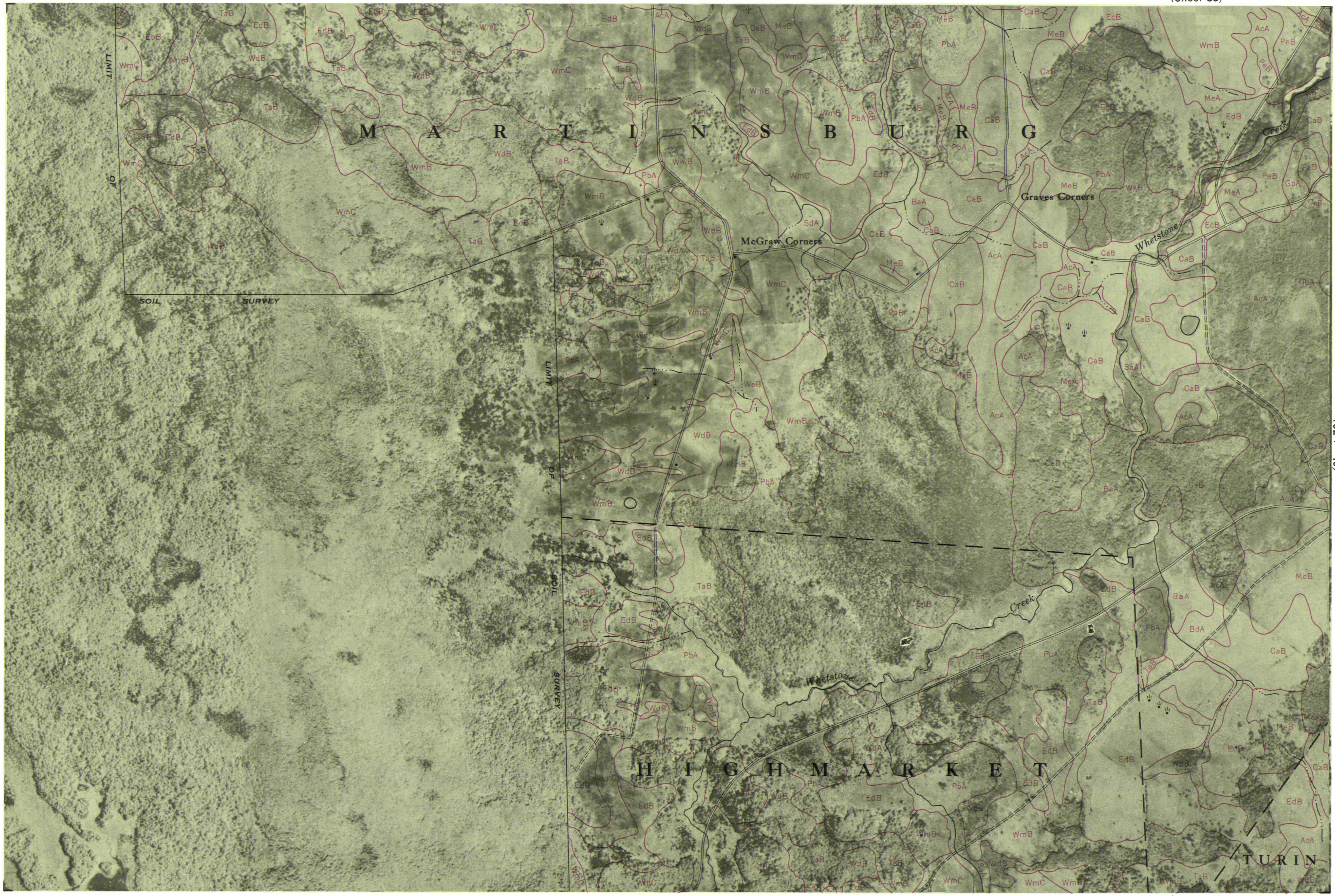

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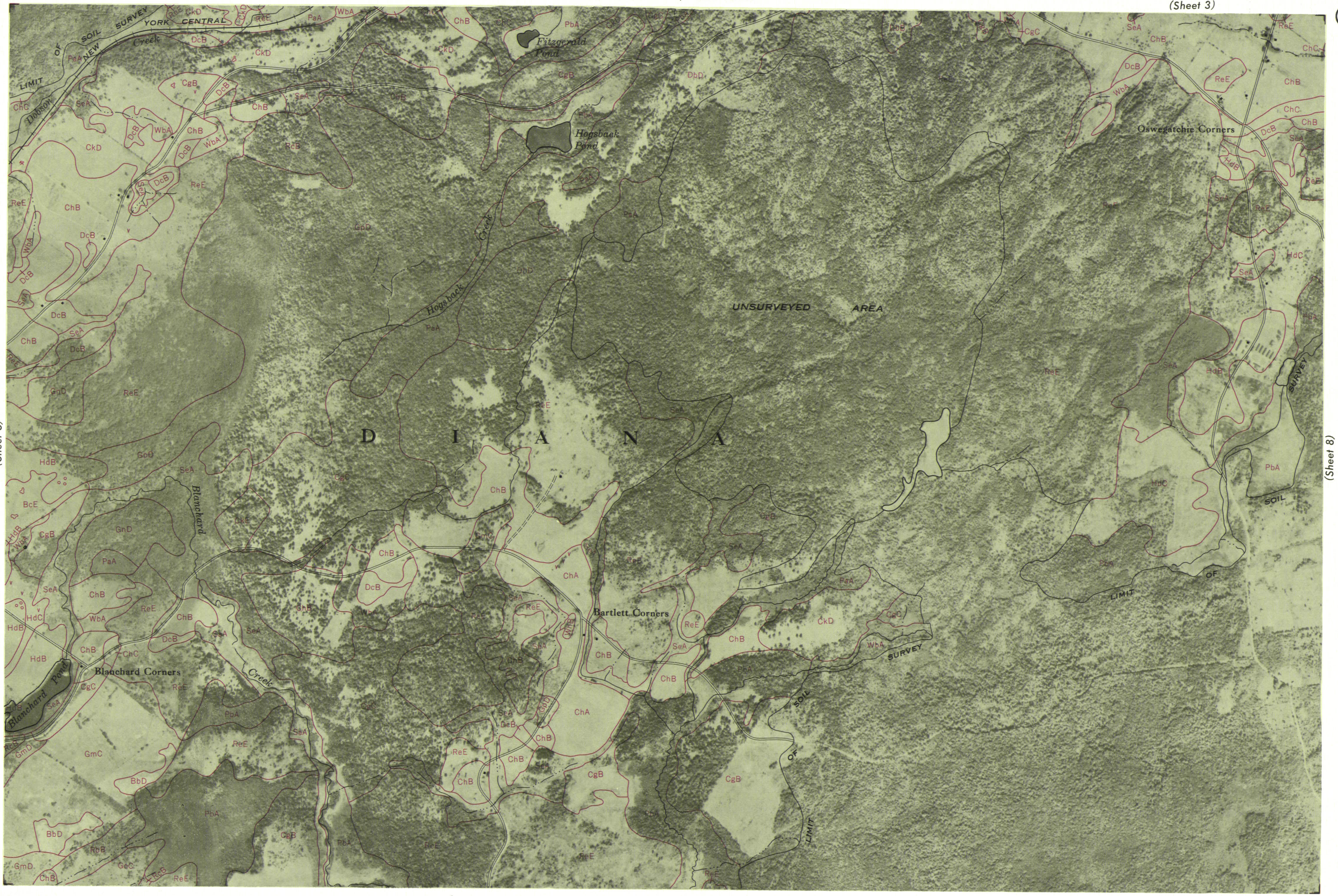

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

LEWIS COUNTY, NEW YORK

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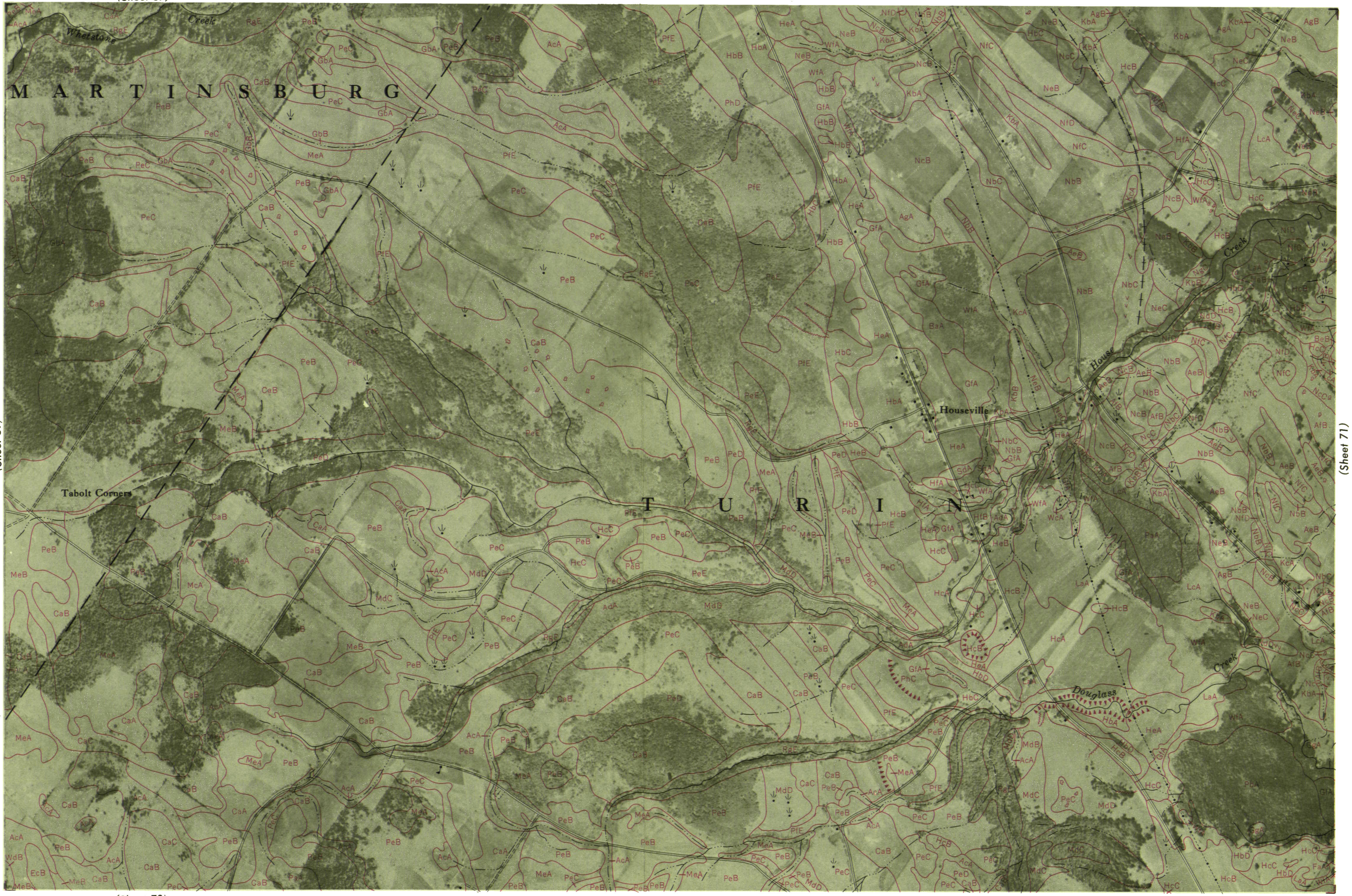

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0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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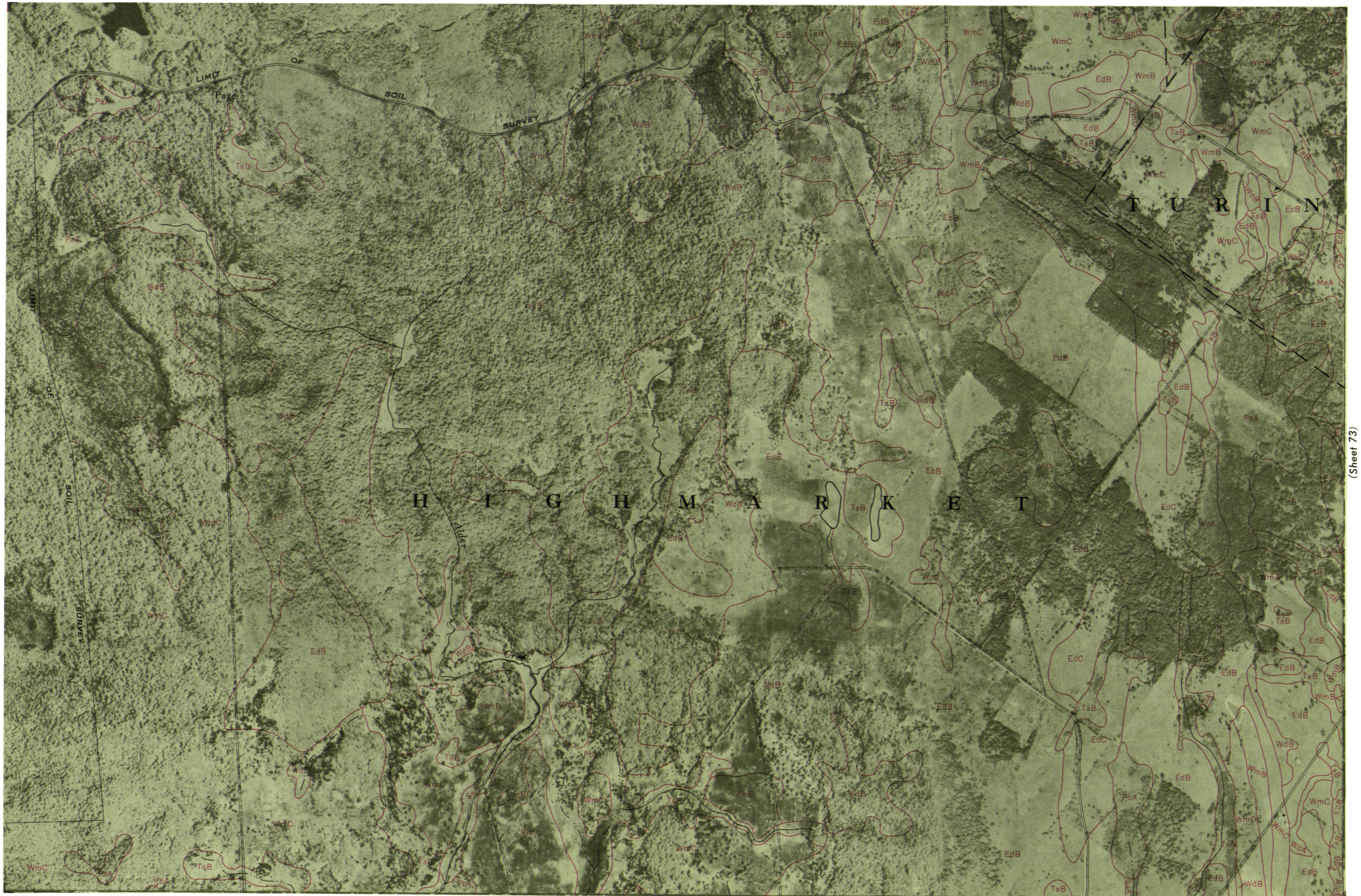
Scale 1:20 000

0 1/2 1 Mile

0 5000 Feet

LEWIS COUNTY, NEW YORK

(Sheet 69)



(Sheet 73)

(Sheet 76)

0 1/2 1 Mile Scale 1:20 000 0 5000 Feet

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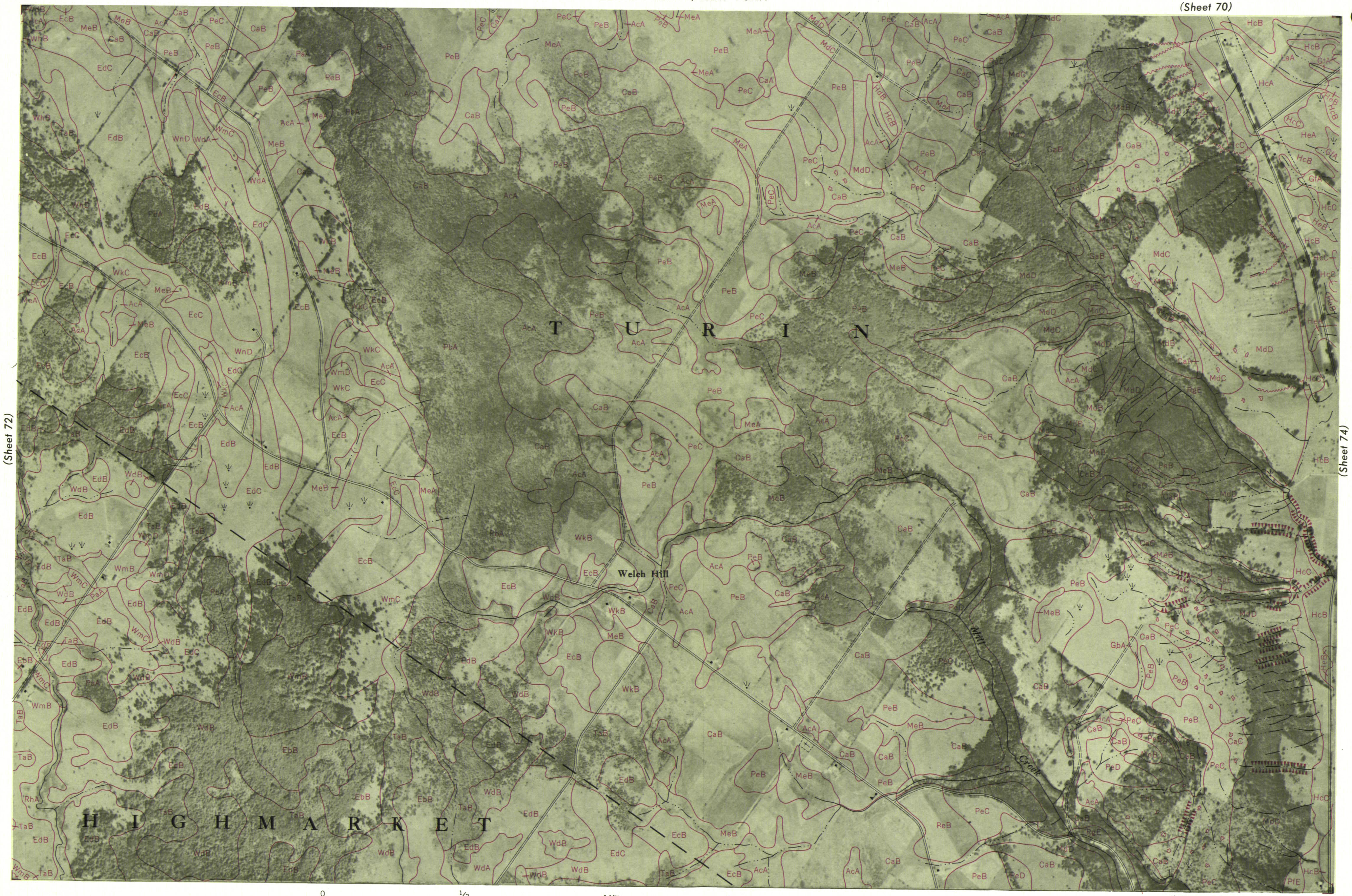

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0 1/2 1 Mile Scale 1:20000 0 5000 Feet

LEWIS COUNTY, NEW YORK

(Sheet 71)

N

(Sheet 73)

(Sheet 75)

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0 1/2 1 Mile Scale 1:20000 0 5000 Feet

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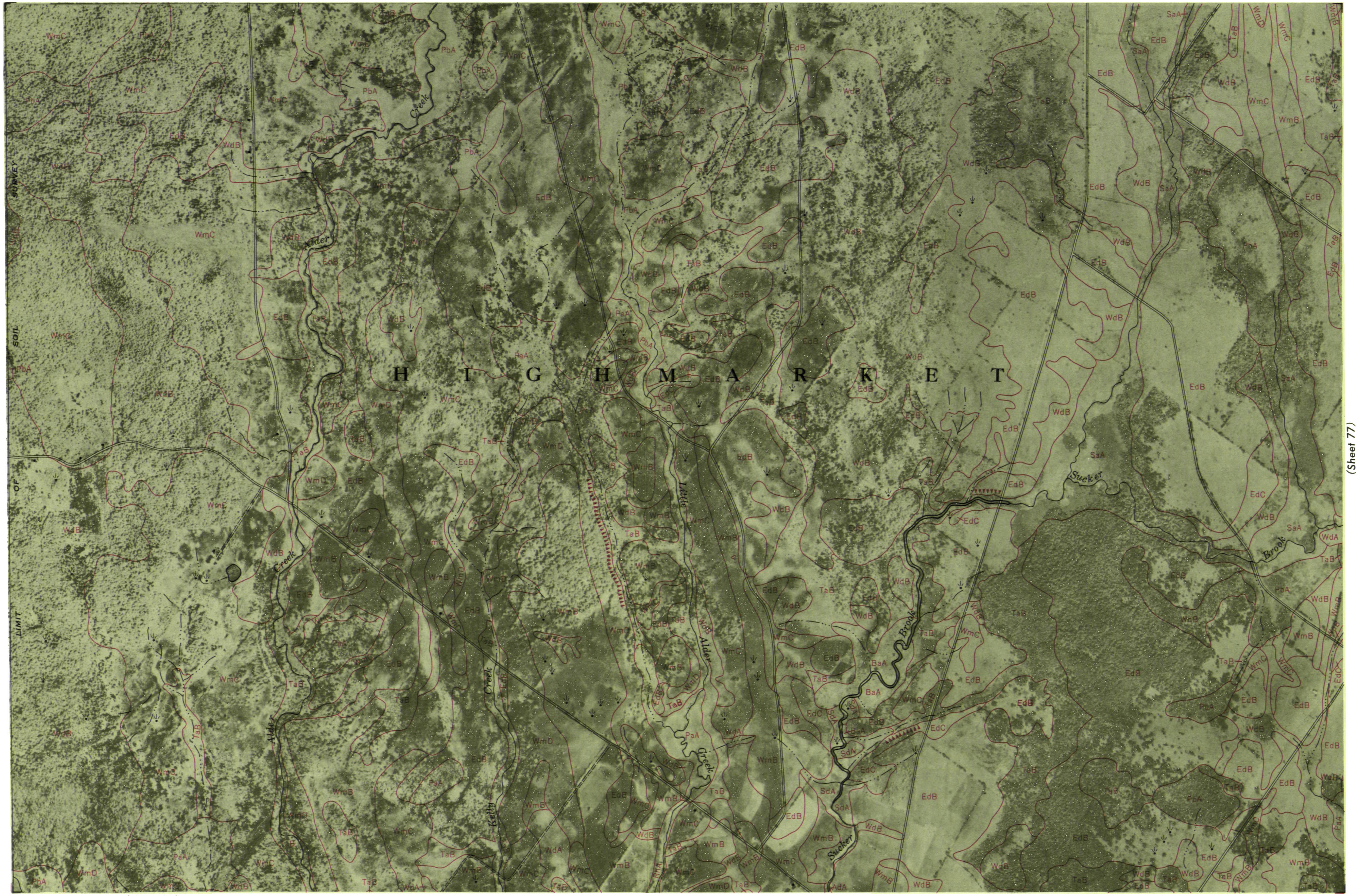
(Sheet 72)

LEWIS COUNTY, NEW YORK



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(Sheet 81)

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

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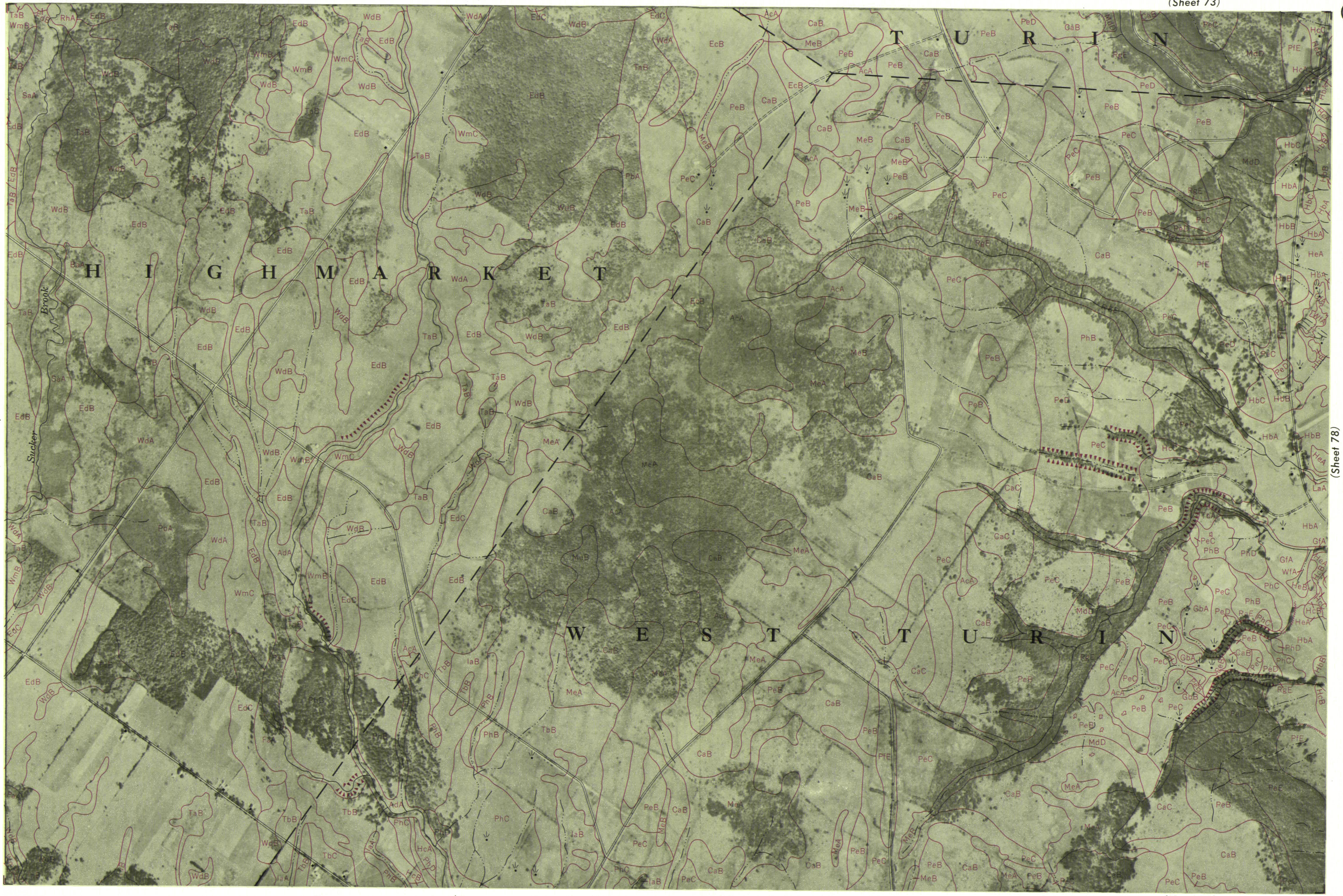

(Sheet 76)

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(Sheet 82)

0 1/2 1 Mile Scale 1:20000 0 5000 Feet

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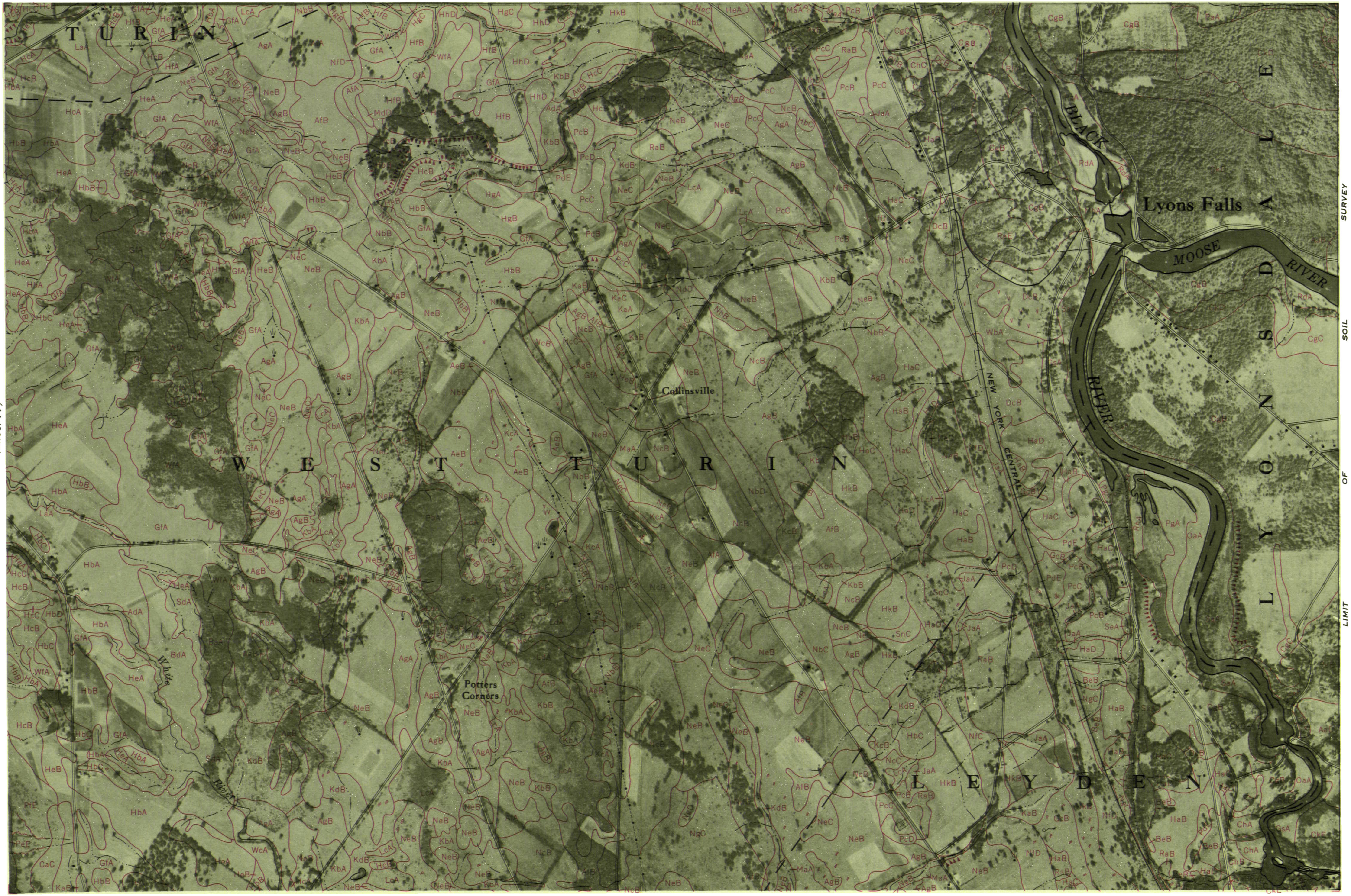

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0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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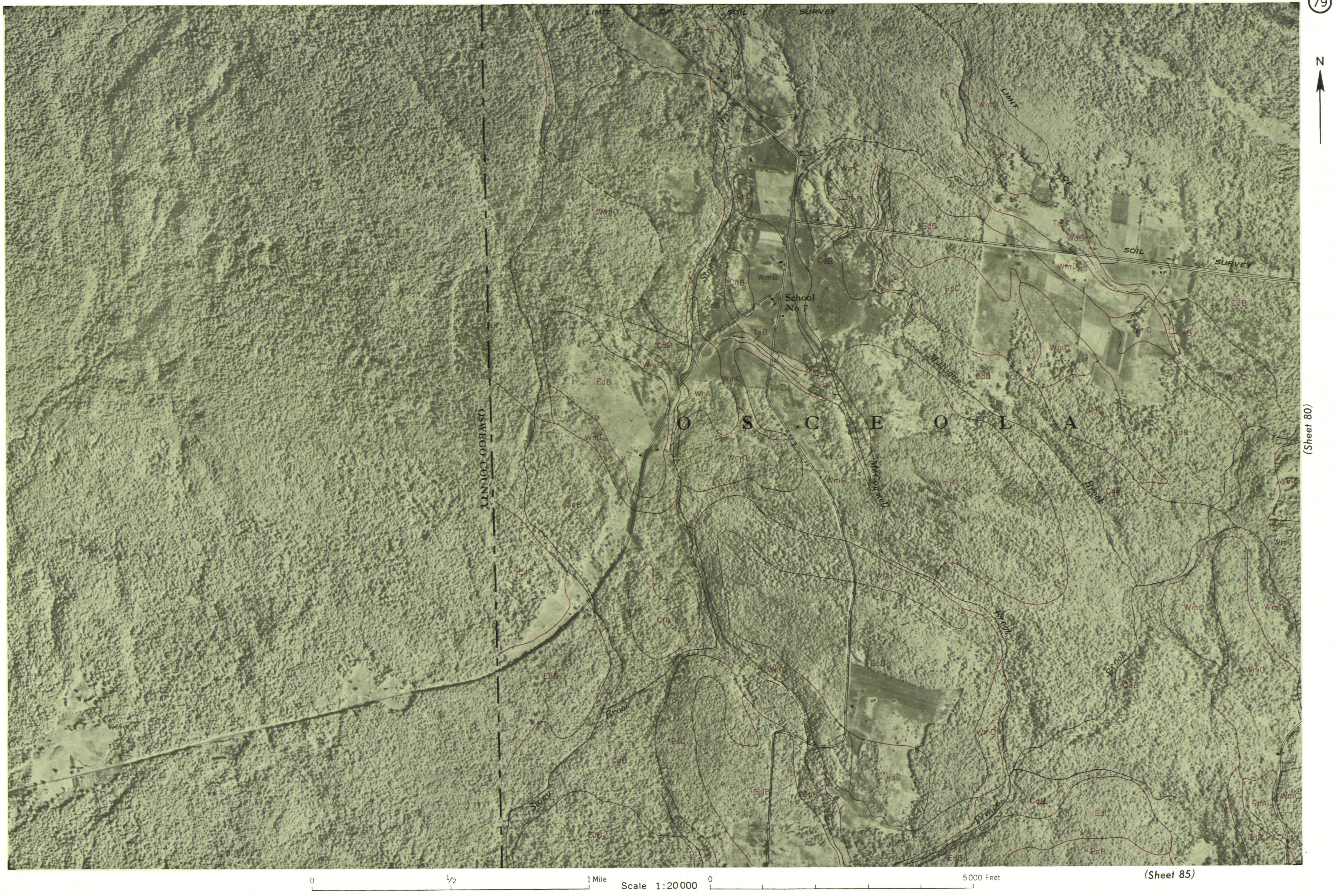

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LEWIS COUNTY, NEW YORK

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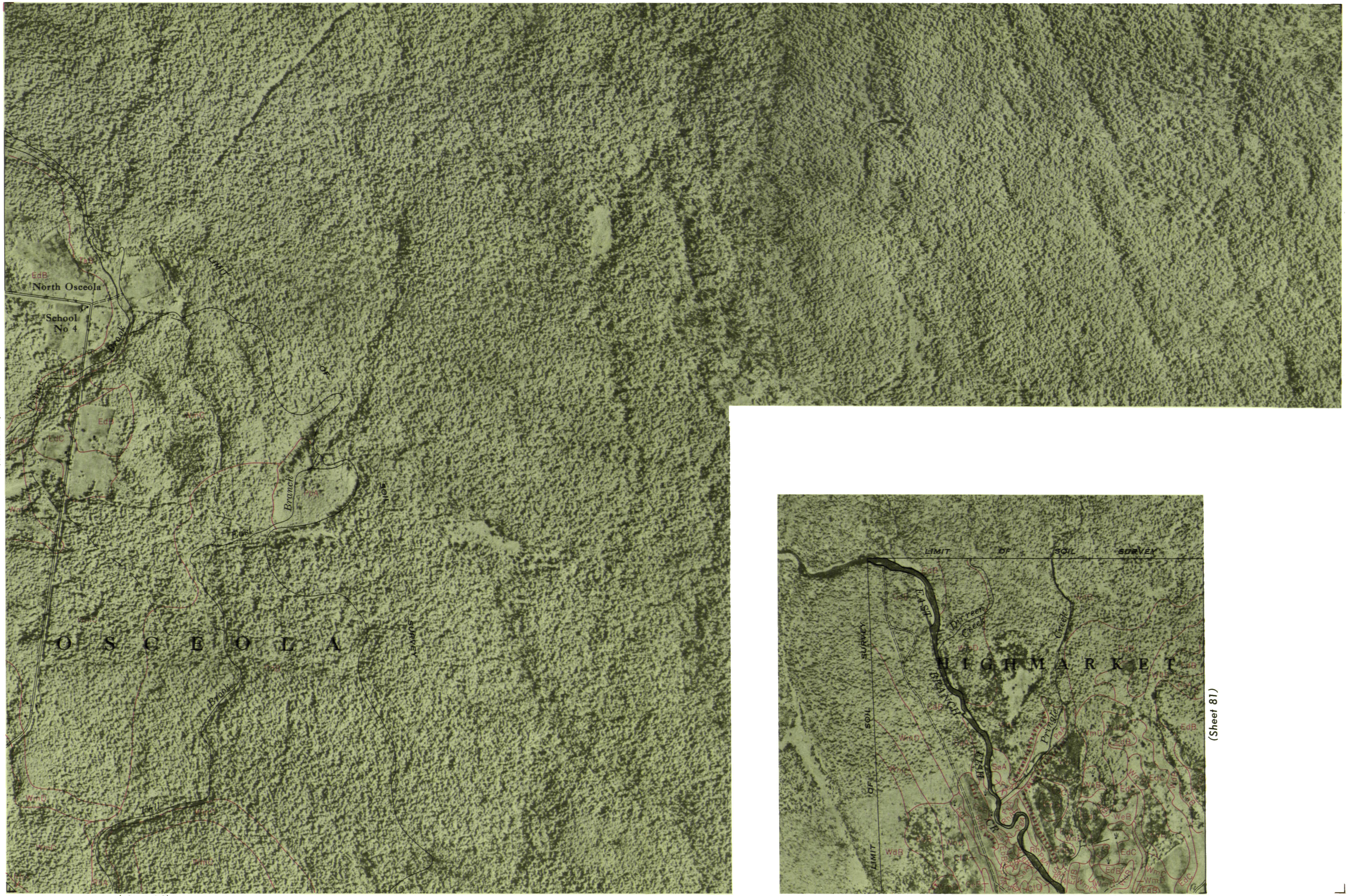

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(Sheet 86)

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

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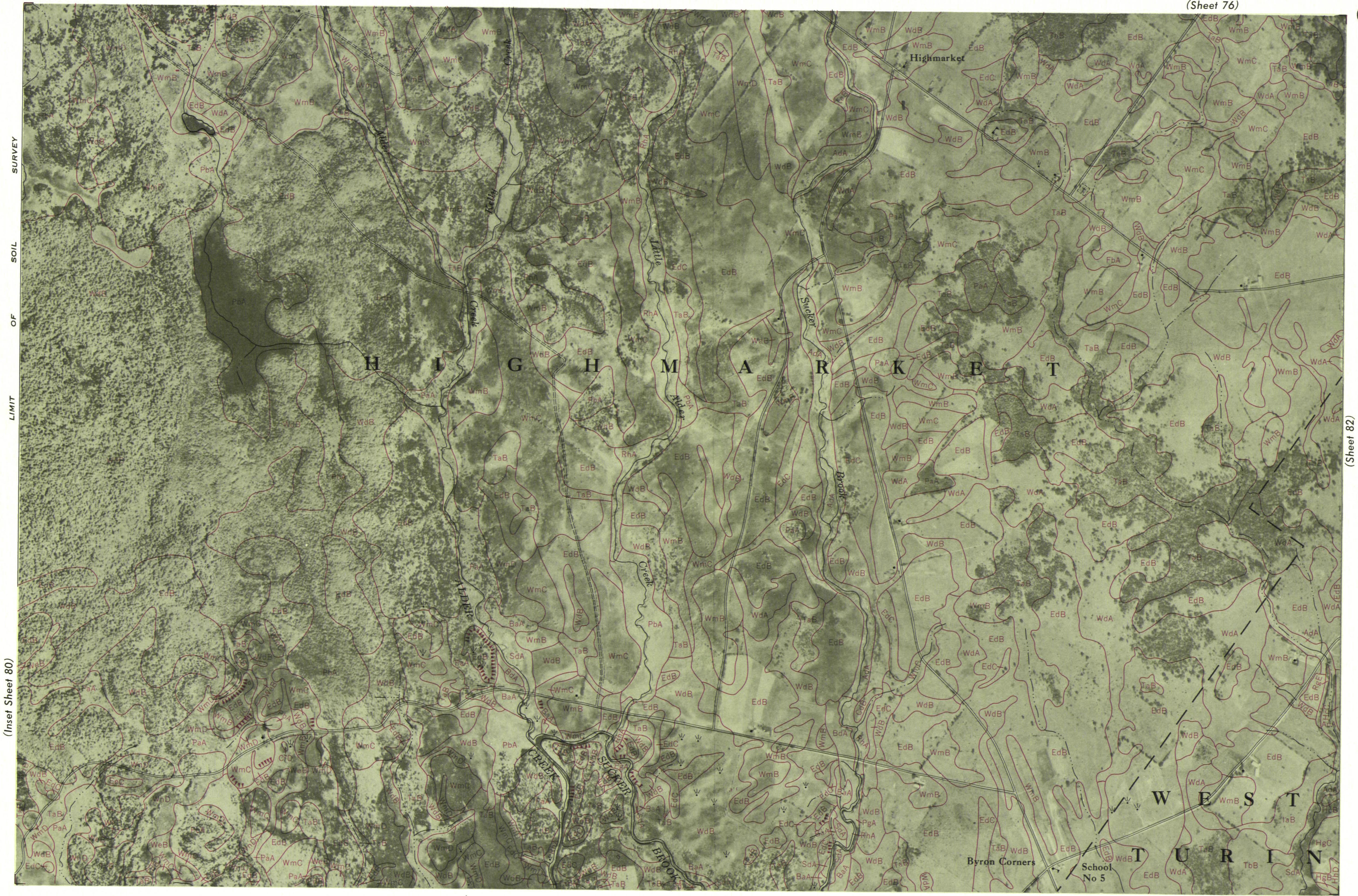

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(Sheet 87)

0 1/2 1 Mile Scale 1:20000 0 5000 Feet

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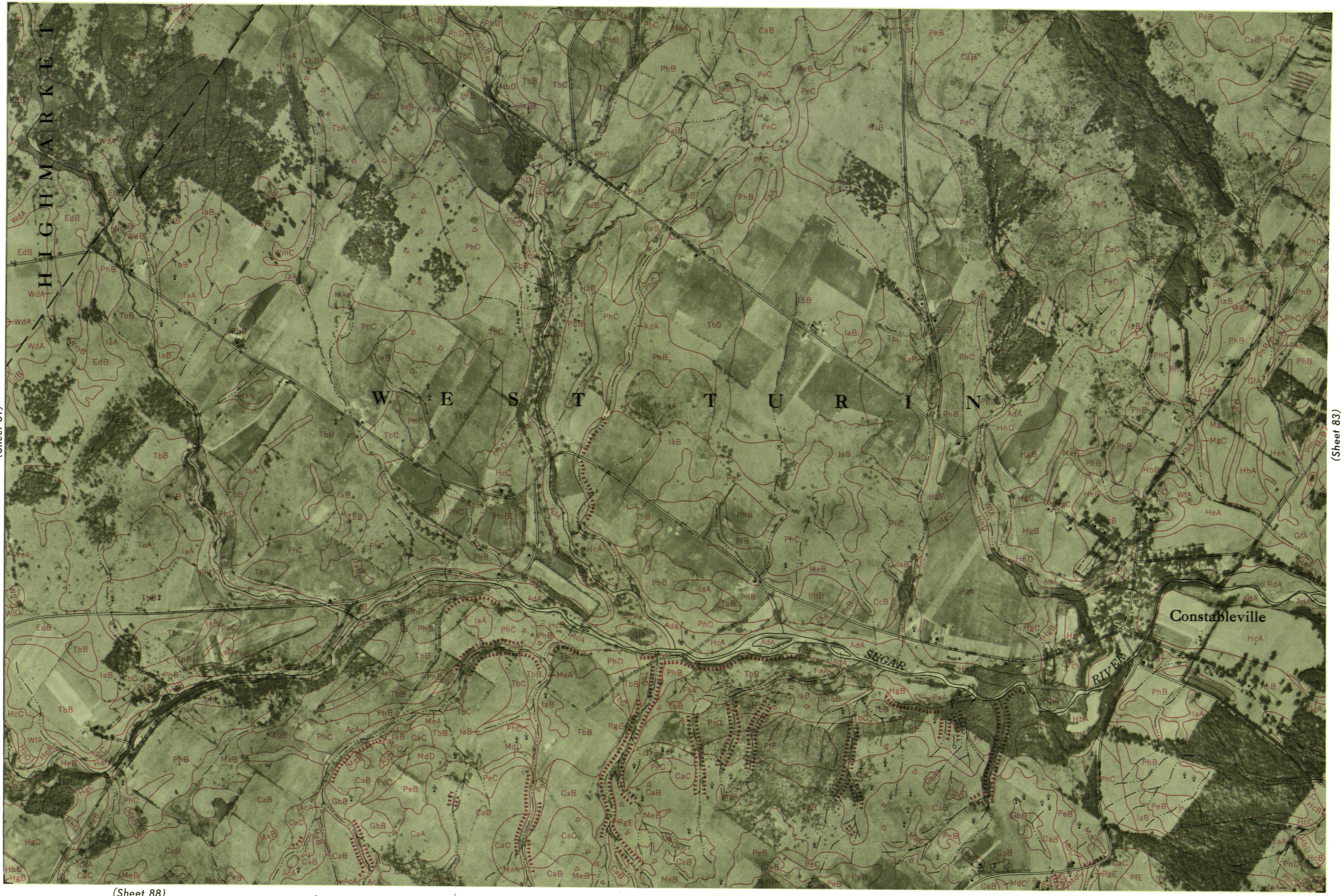

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(Sheet 88)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

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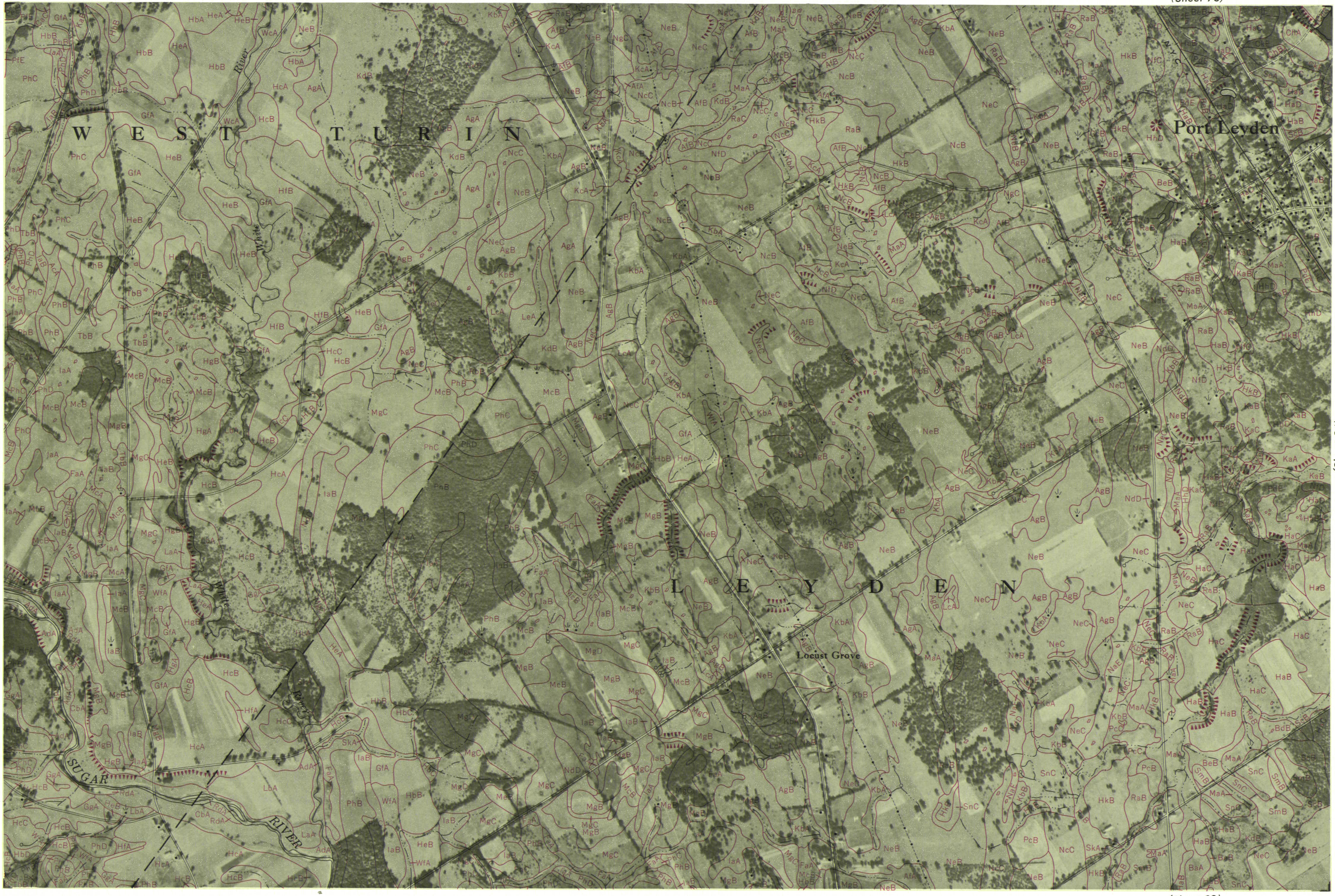
(Sheet 78)

(Sheet 82)



(Sheet 84)

(Sheet 89)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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(Sheet 83)

(Sheet 90)

0 1/2 1 Mile Scale 1:20000 0 5000 Feet

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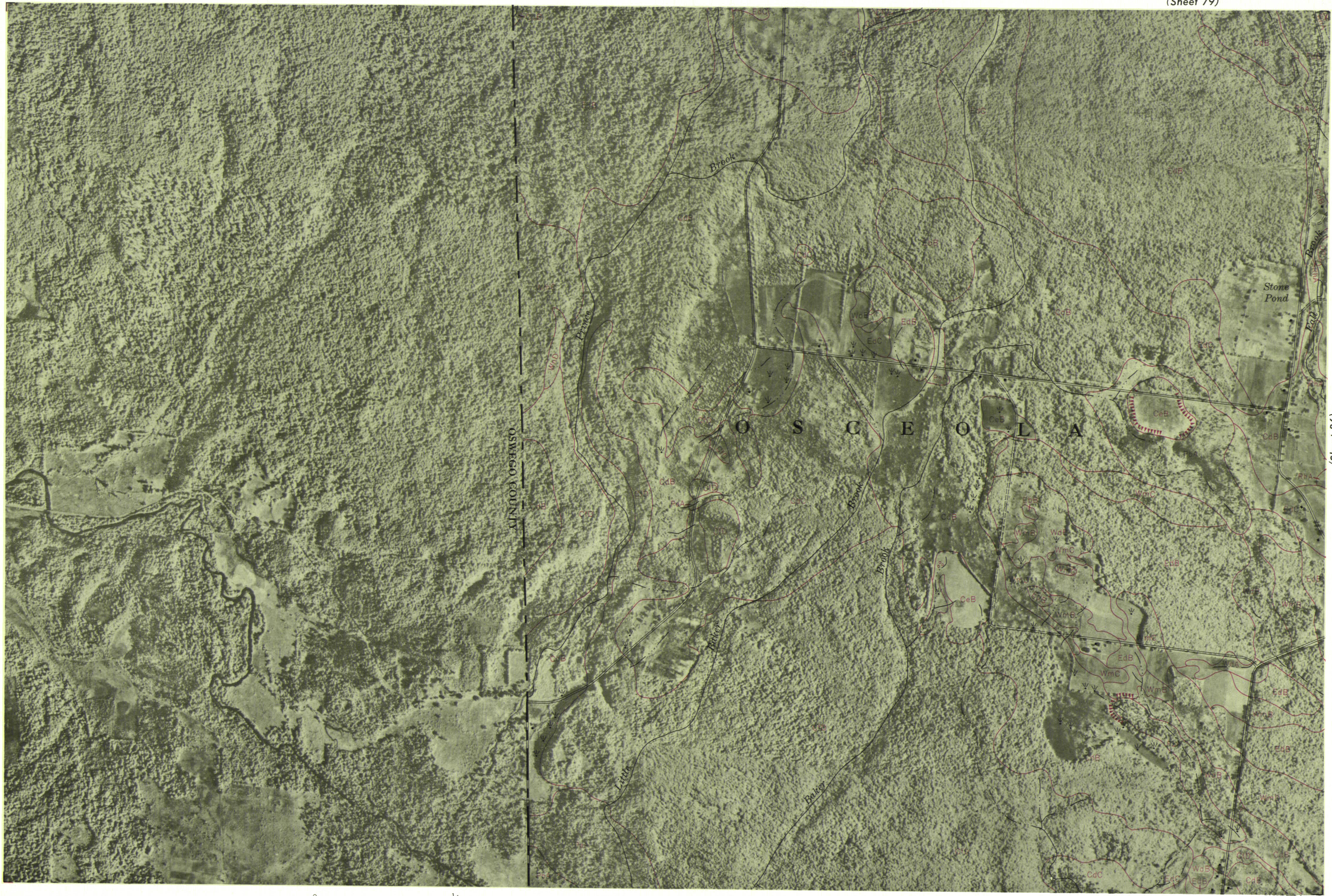
(Sheet 79)



(Sheet 86)

(Sheet 91)

0 1/2 1 Mile Scale 1:20000 0 5000 Feet

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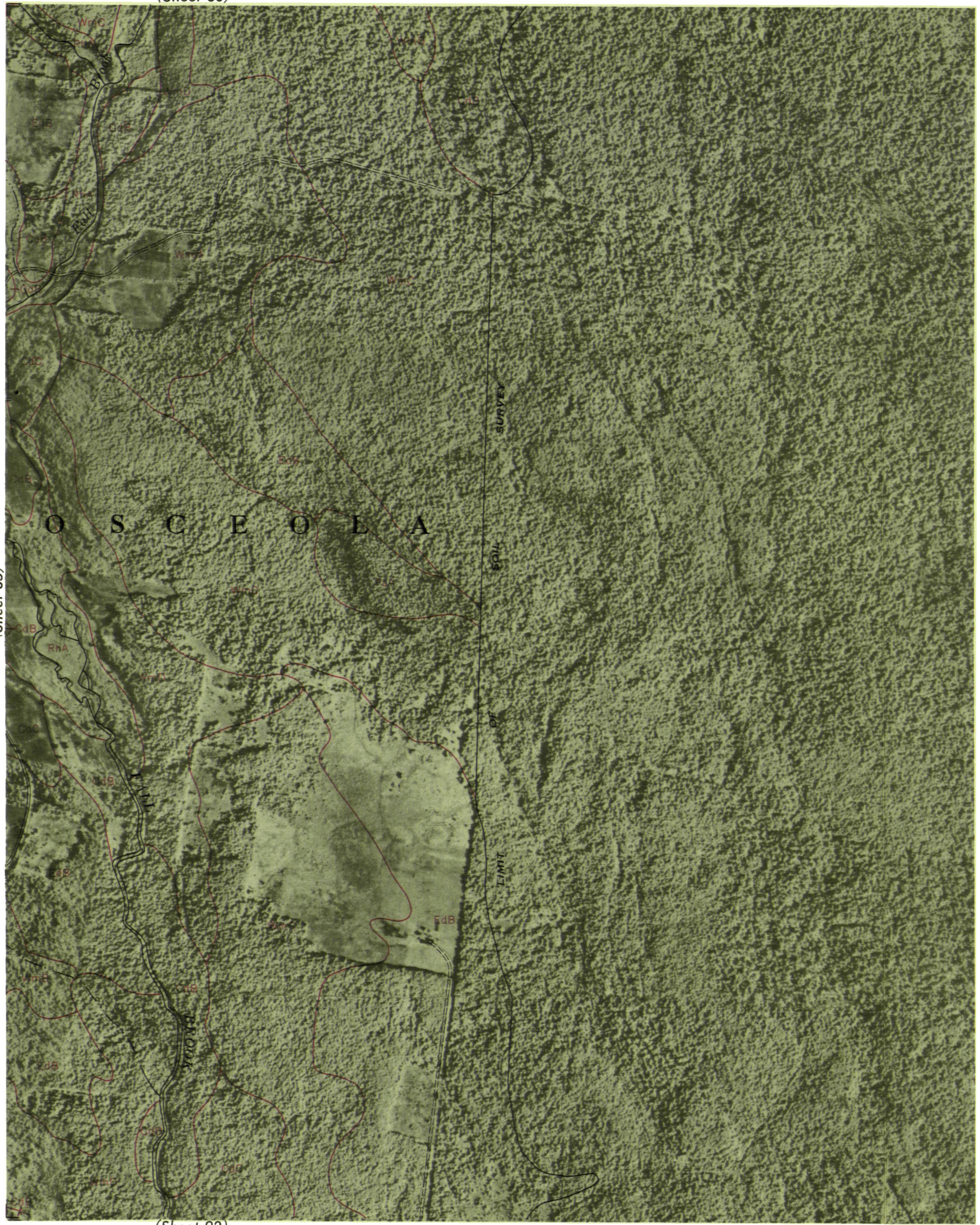
(Sheet 80)



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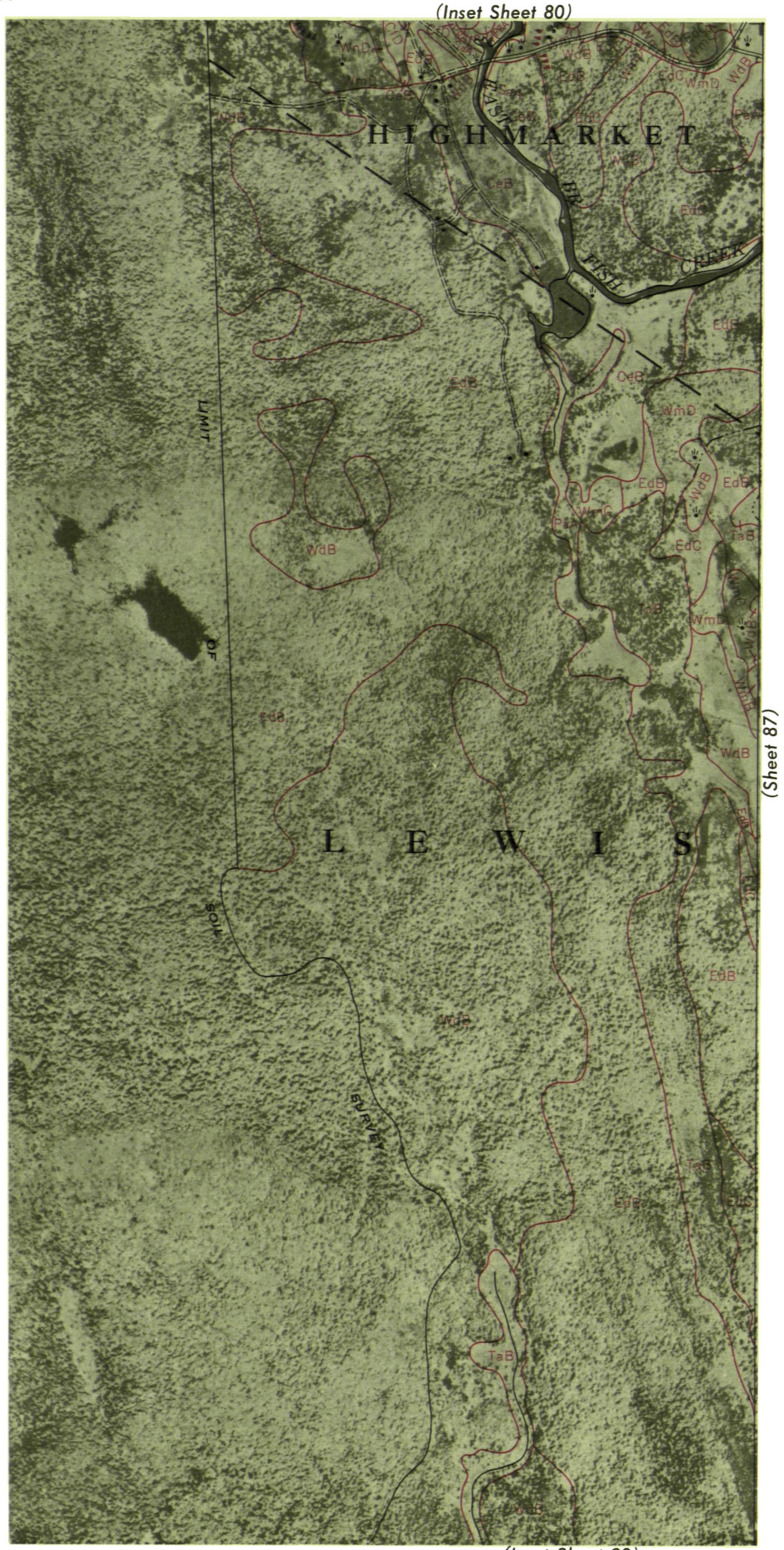

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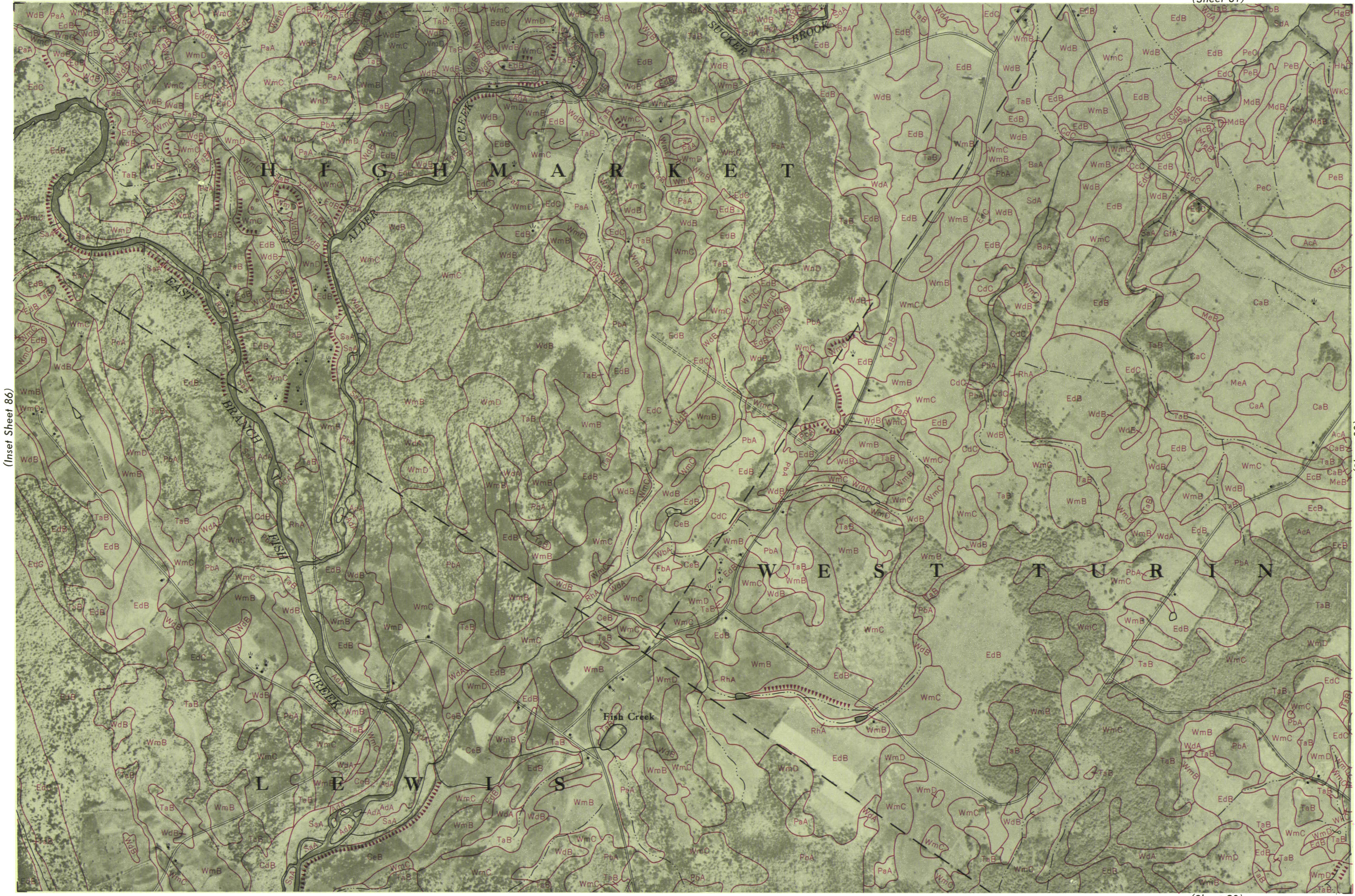

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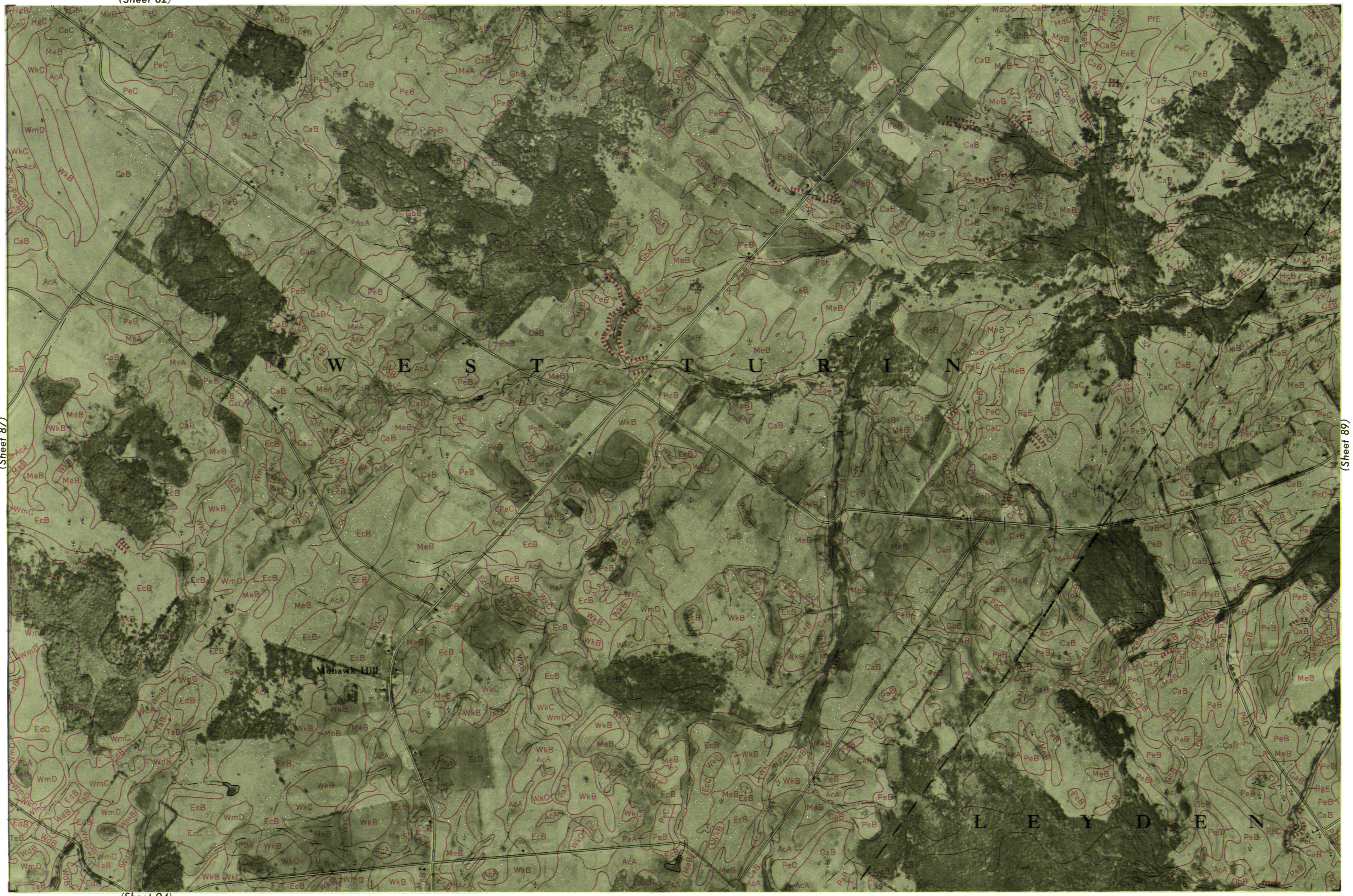

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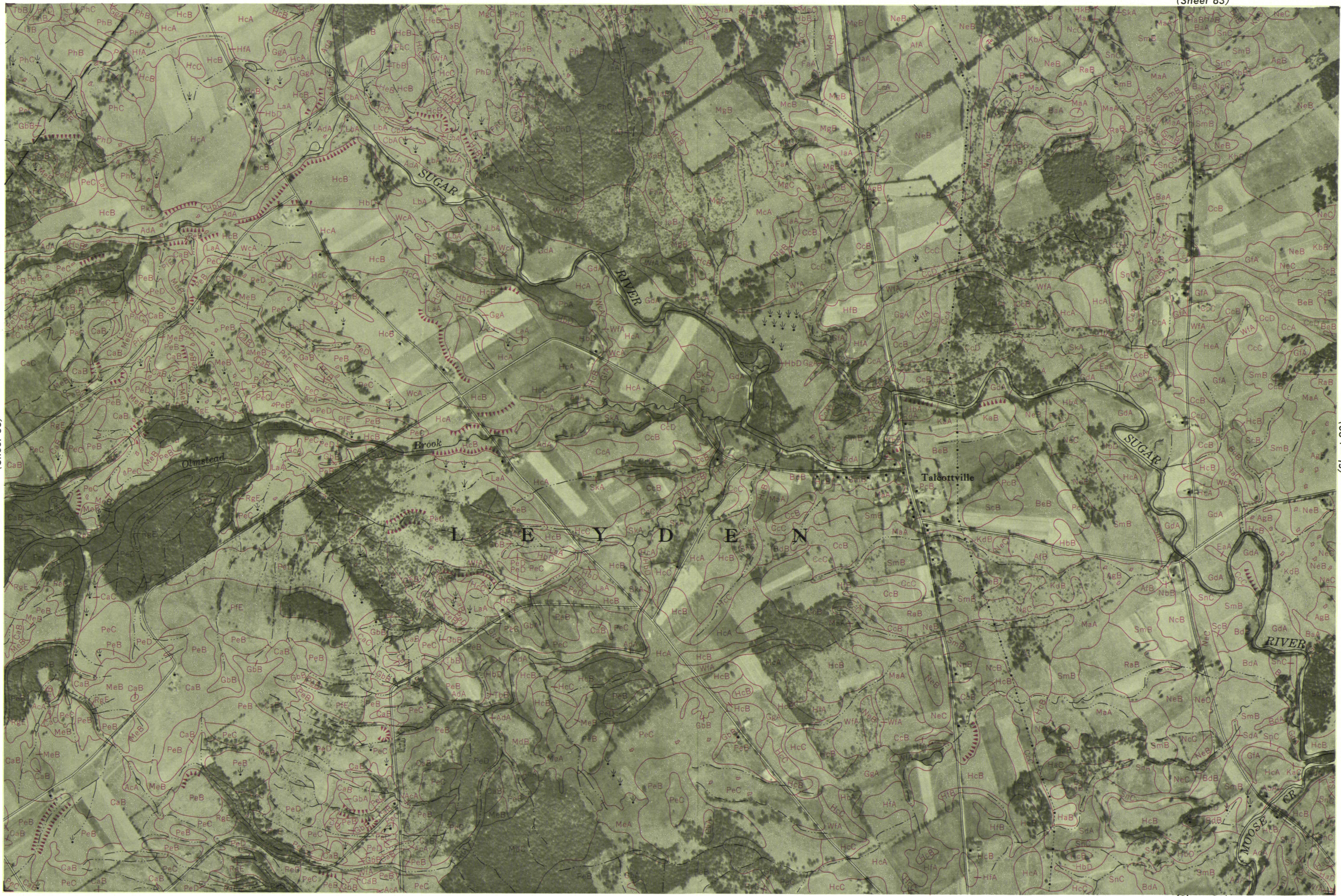

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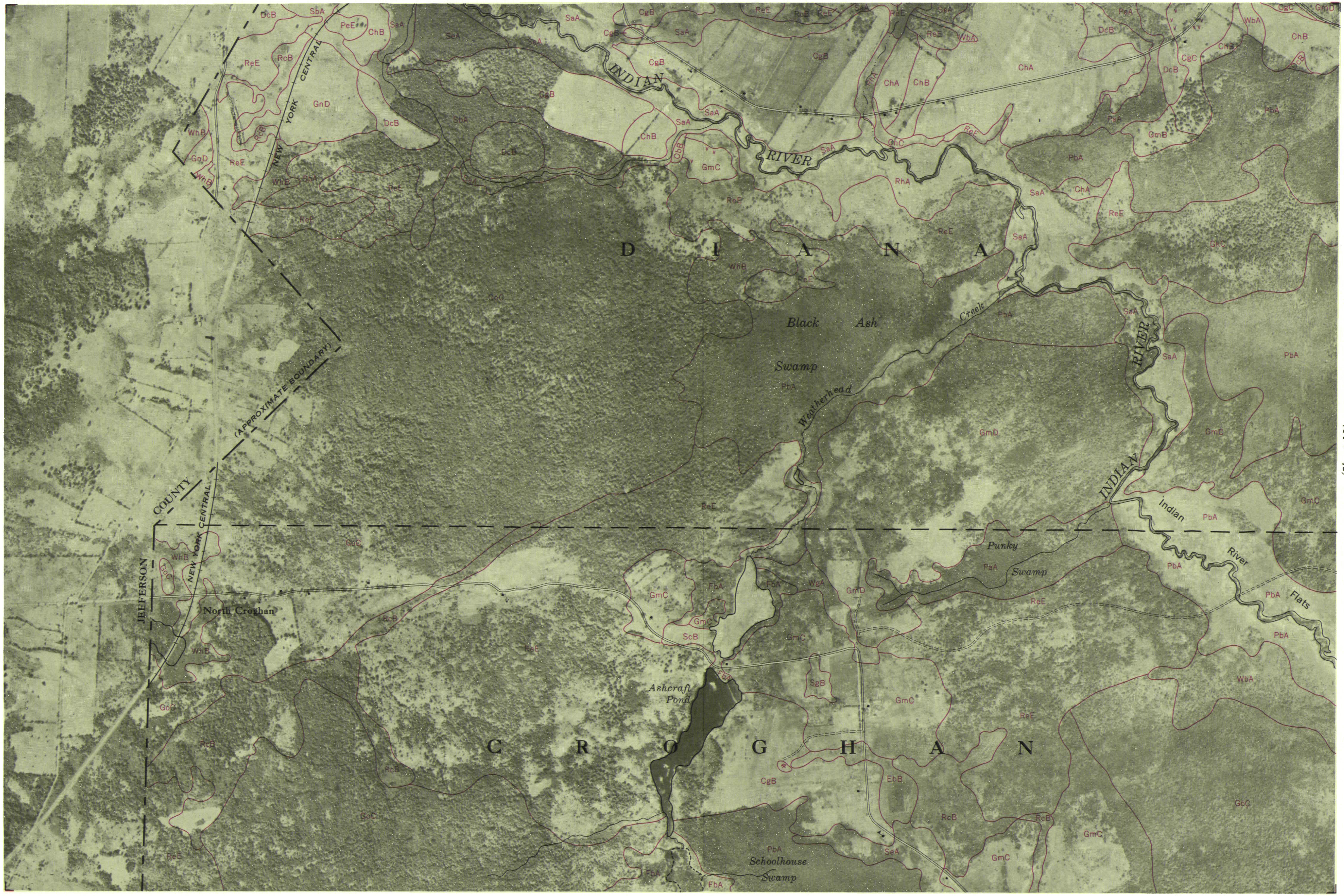

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0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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LEWIS COUNTY, NEW YORK

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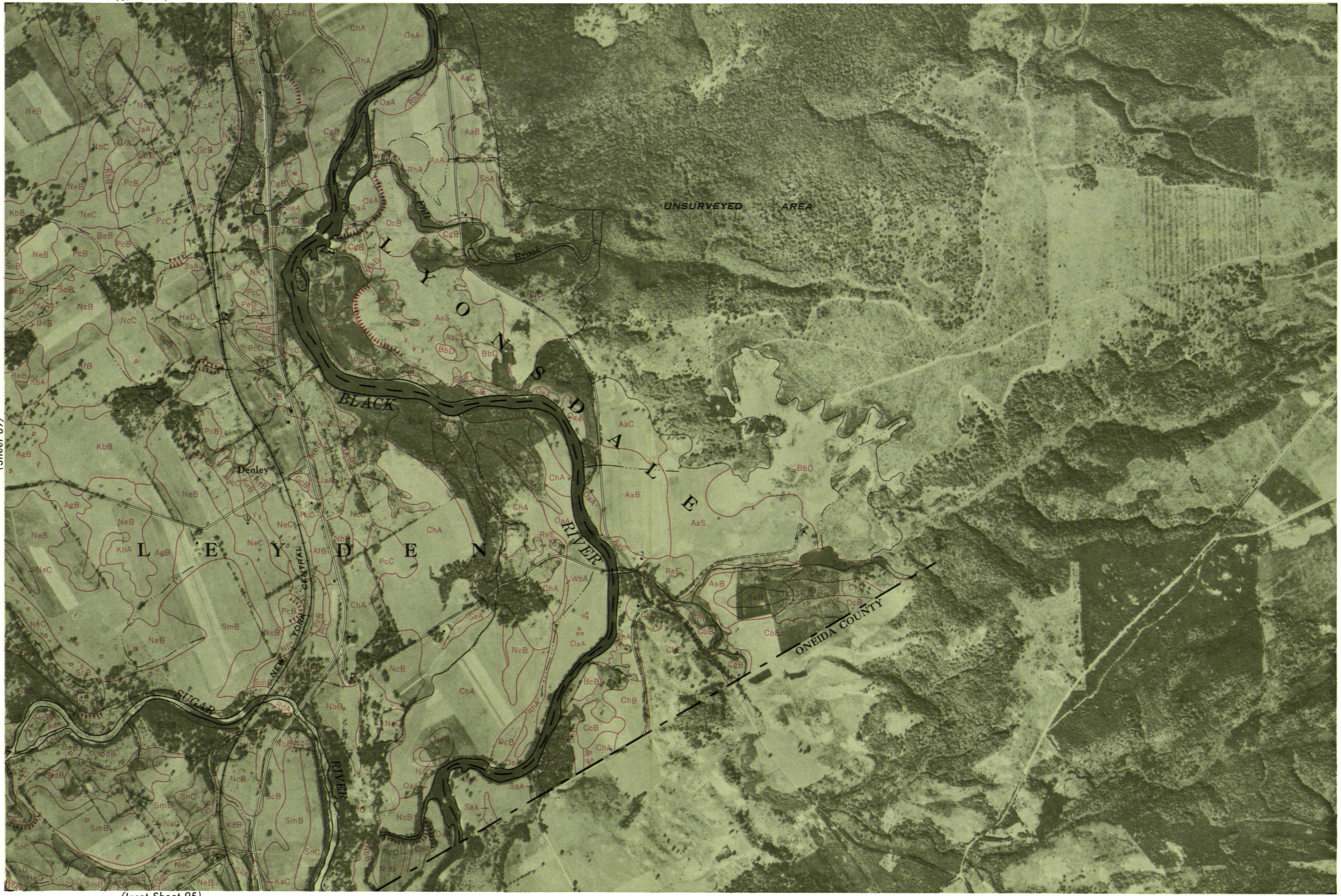

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(Sheet 85)

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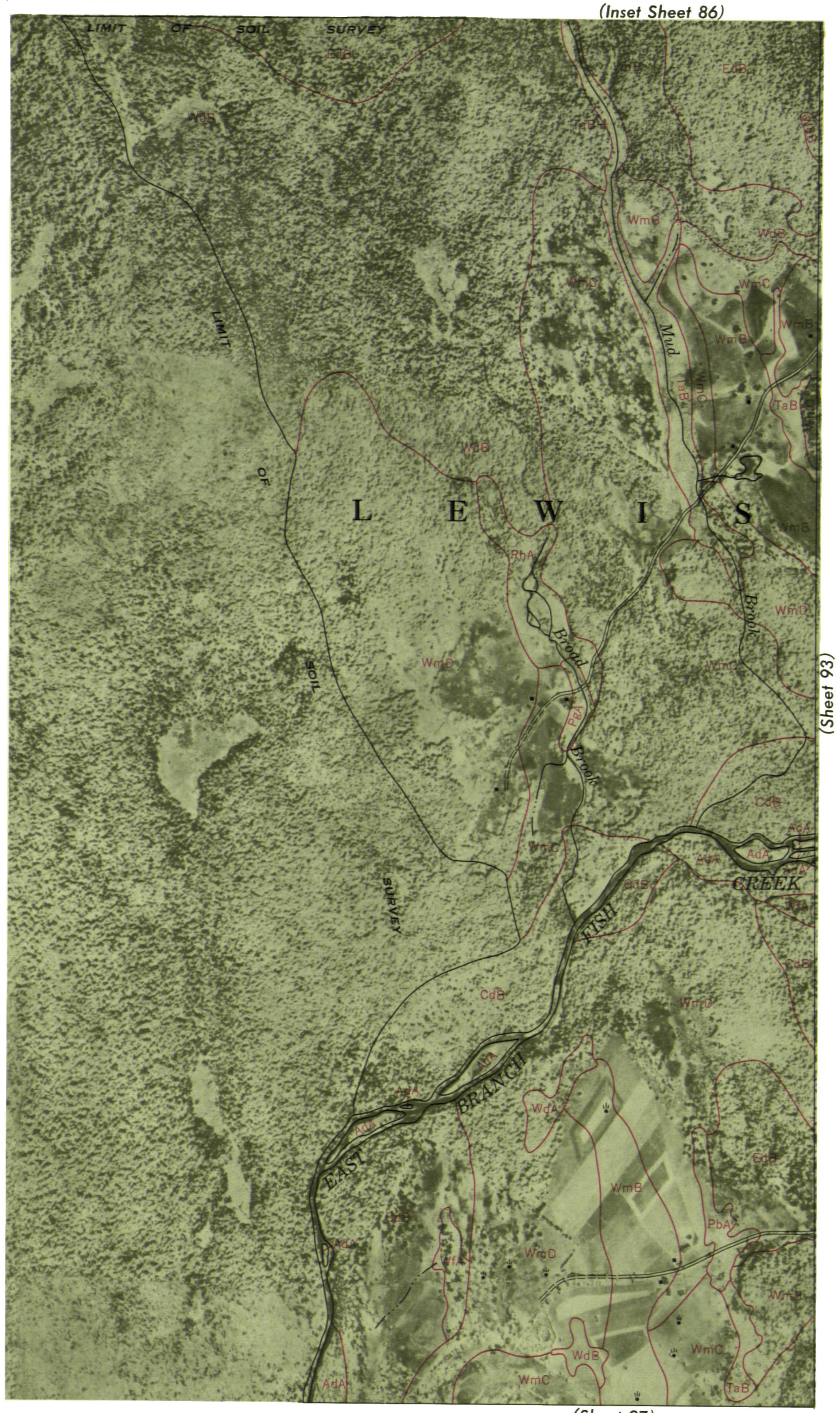
(Sheet 86) (Inset Sheet 86)



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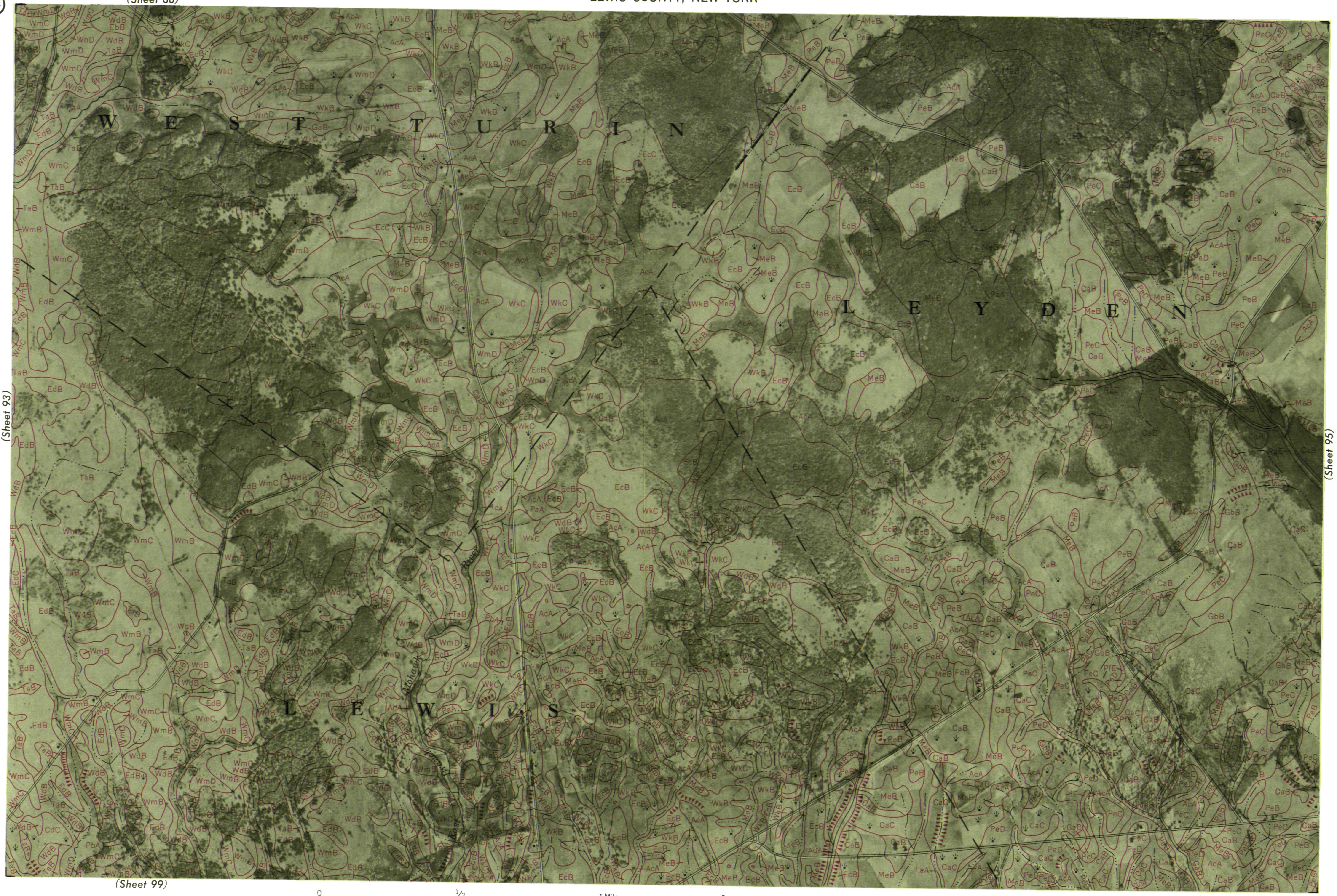
LEWIS COUNTY, NEW YORK



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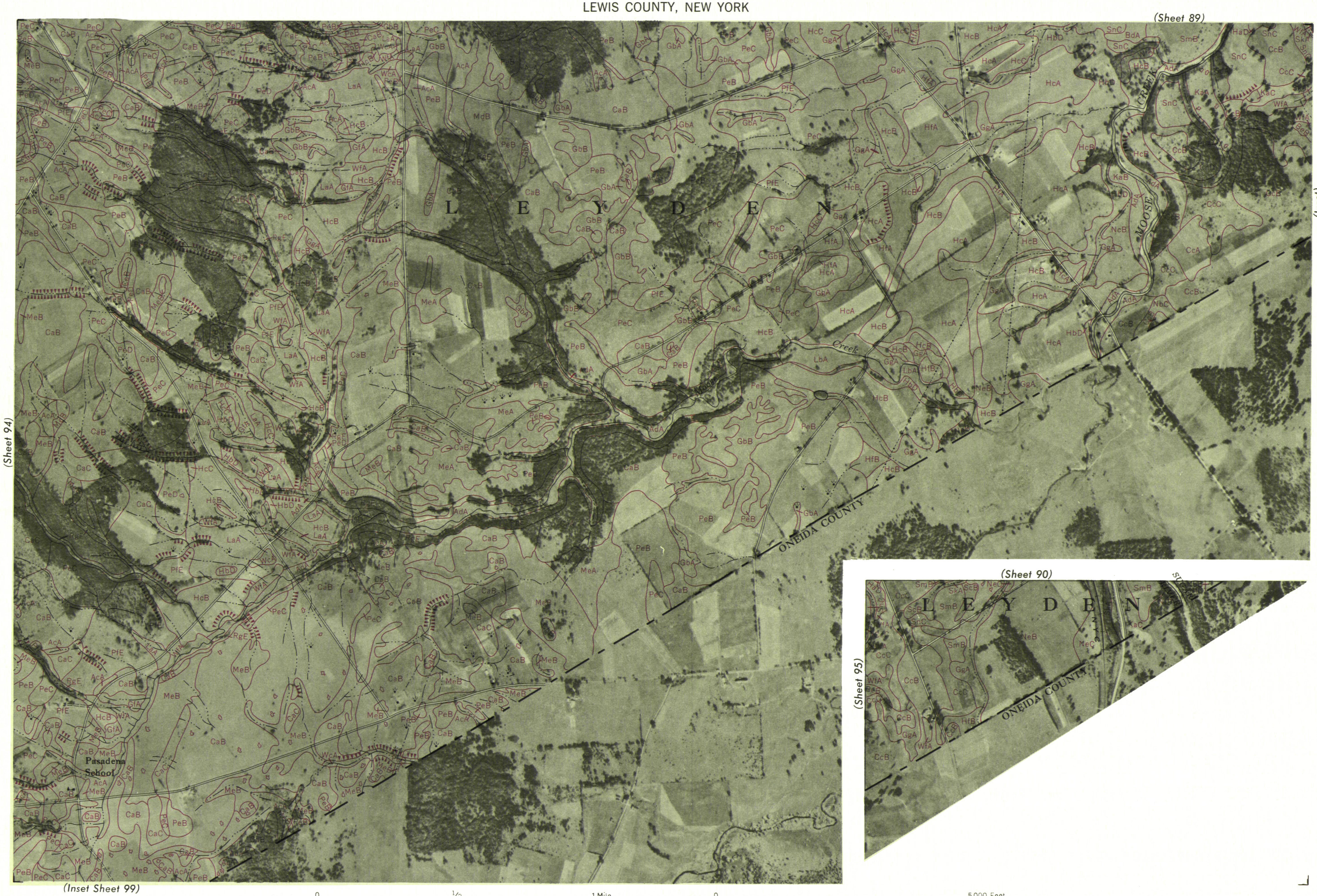

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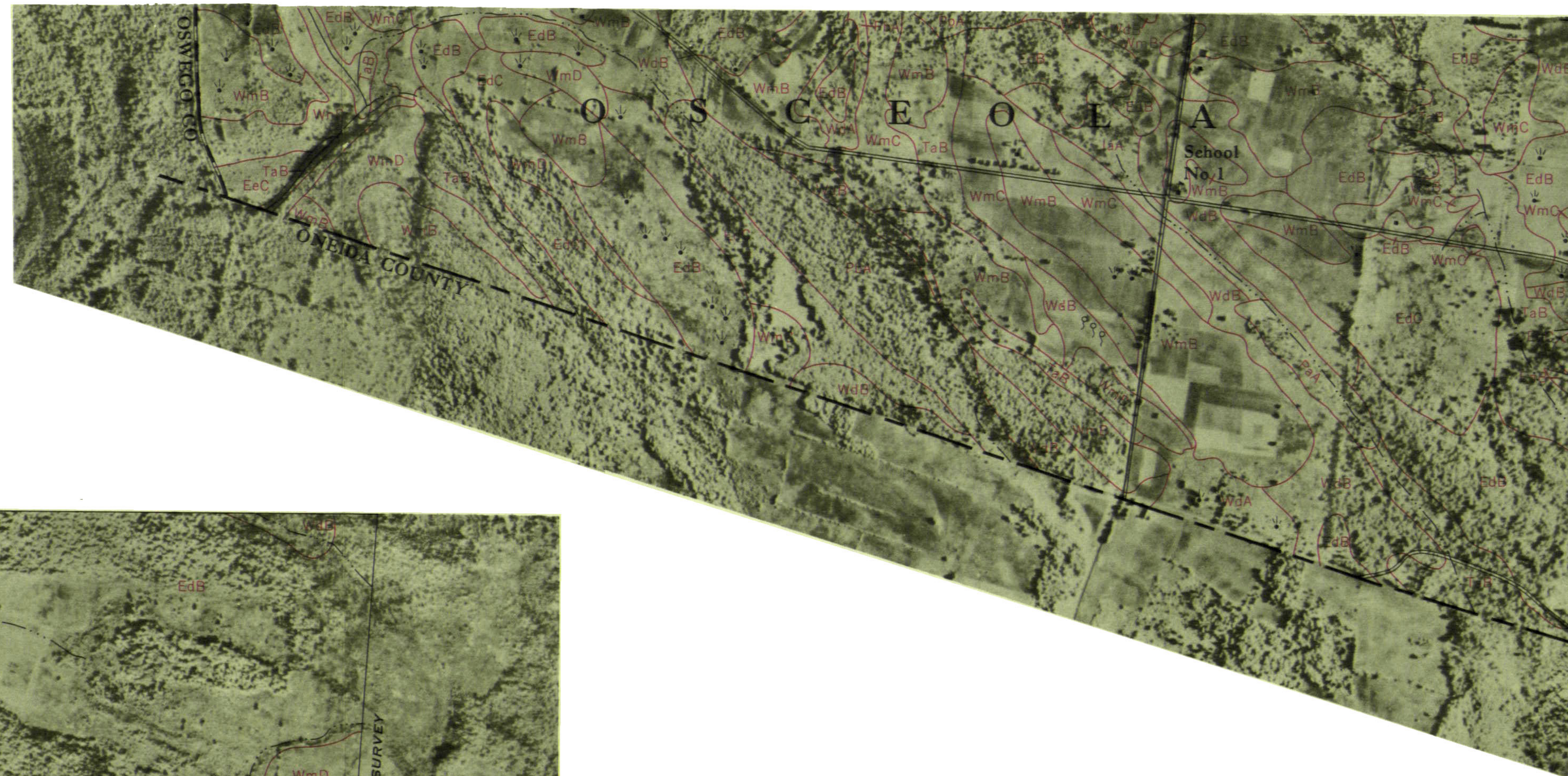
LEWIS COUNTY, NEW YORK



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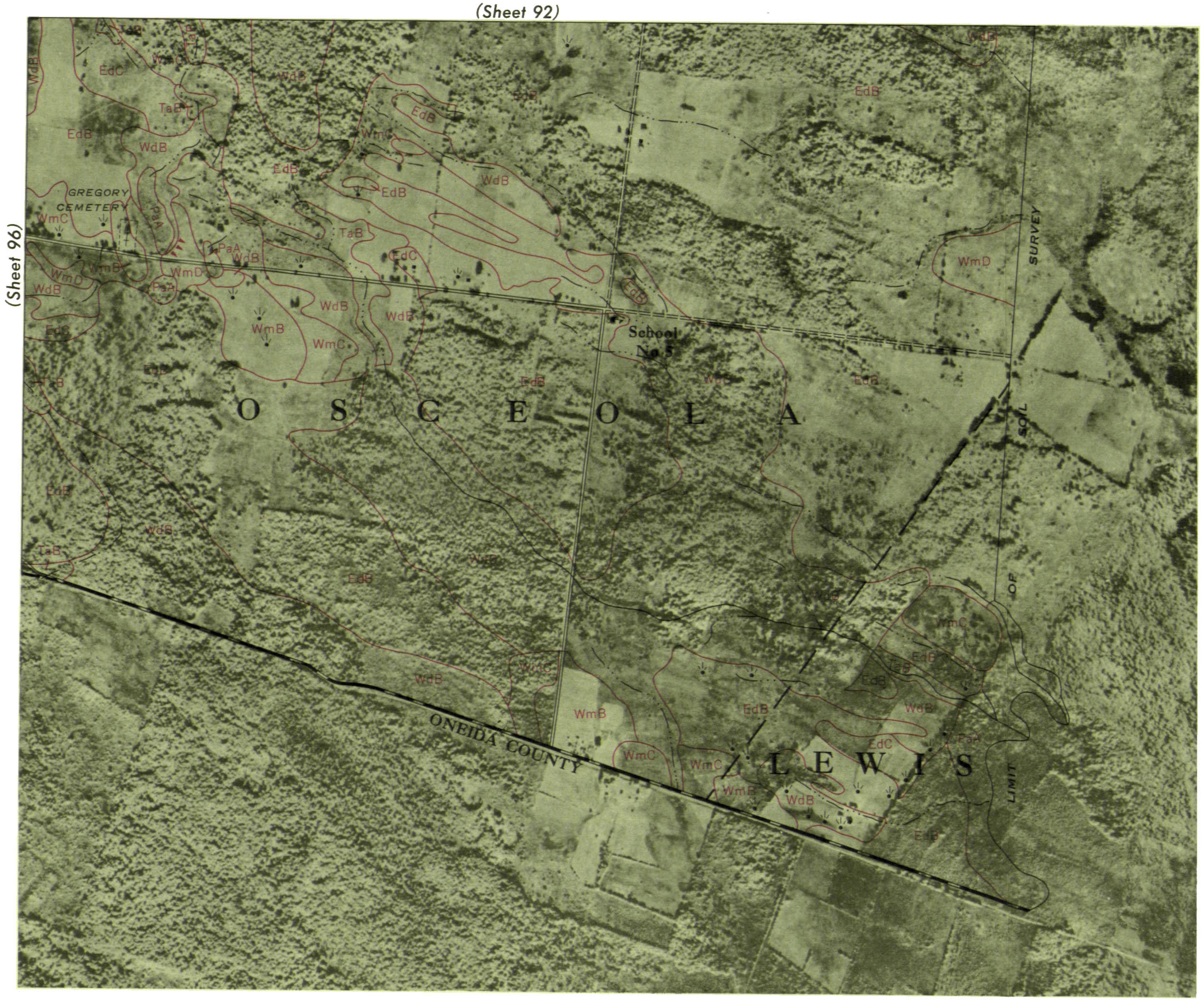

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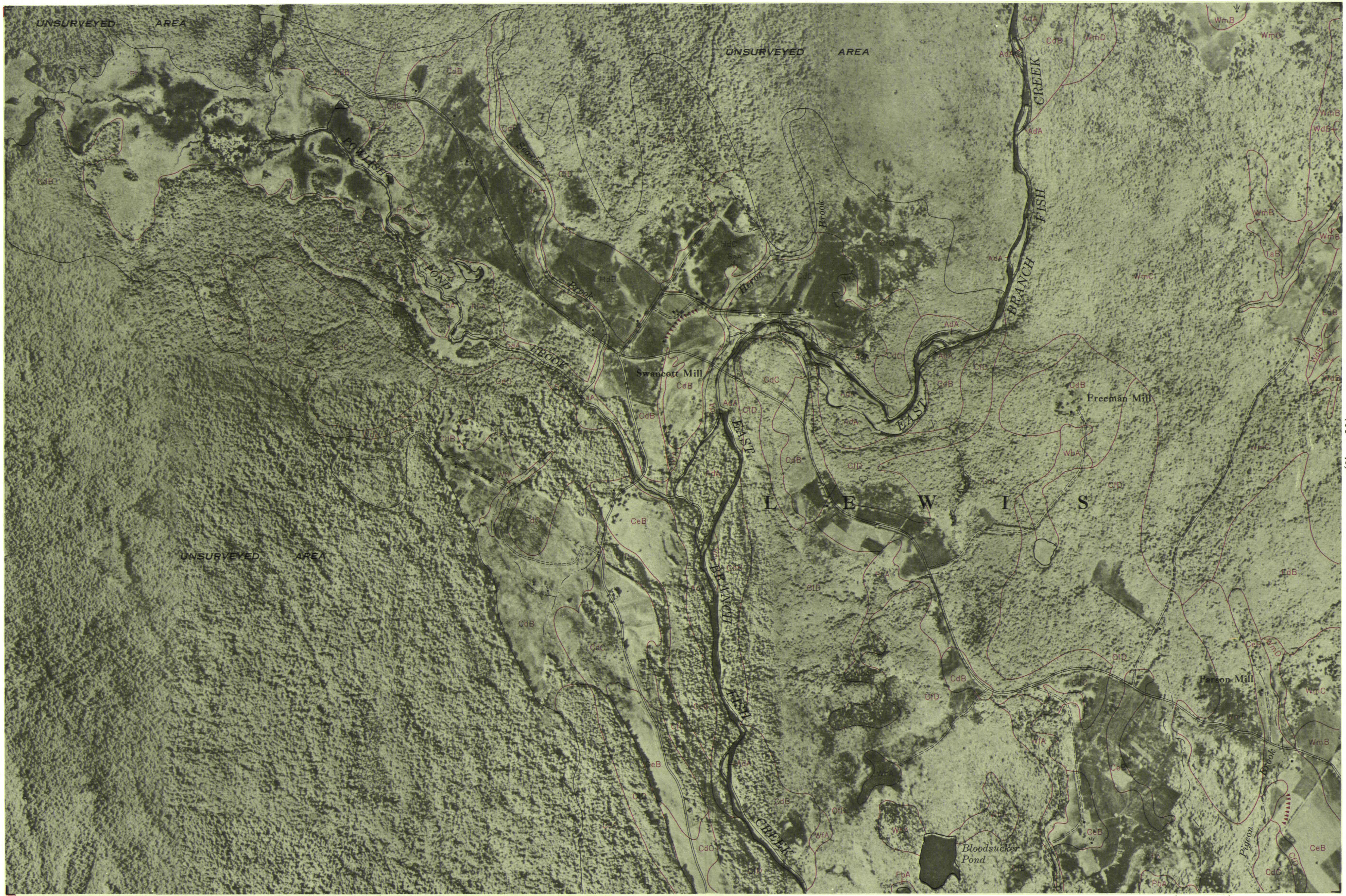

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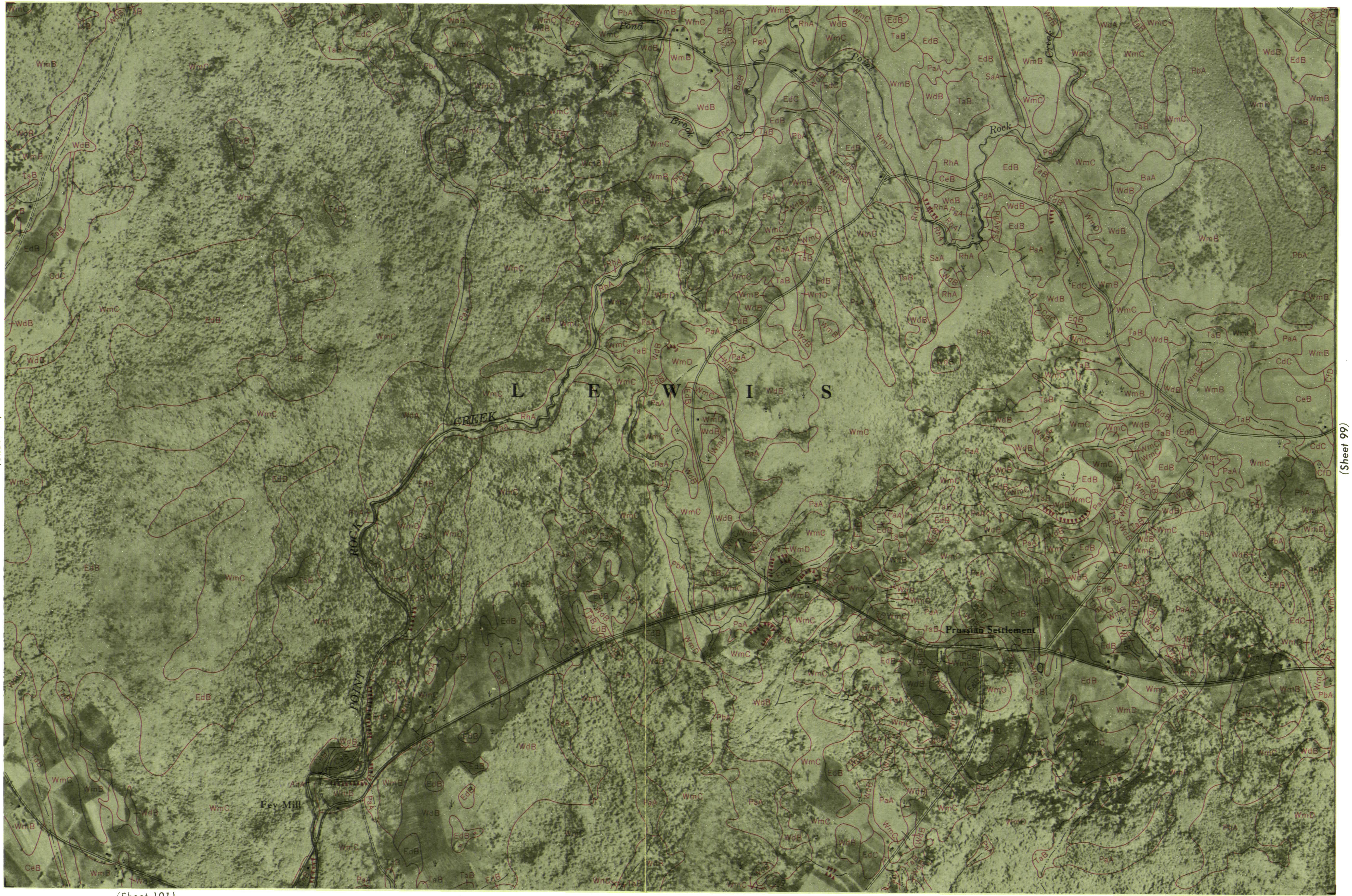
Scale 1:20 000

0 1/2 1 Mile

0 5000 Feet

(Sheet 93)



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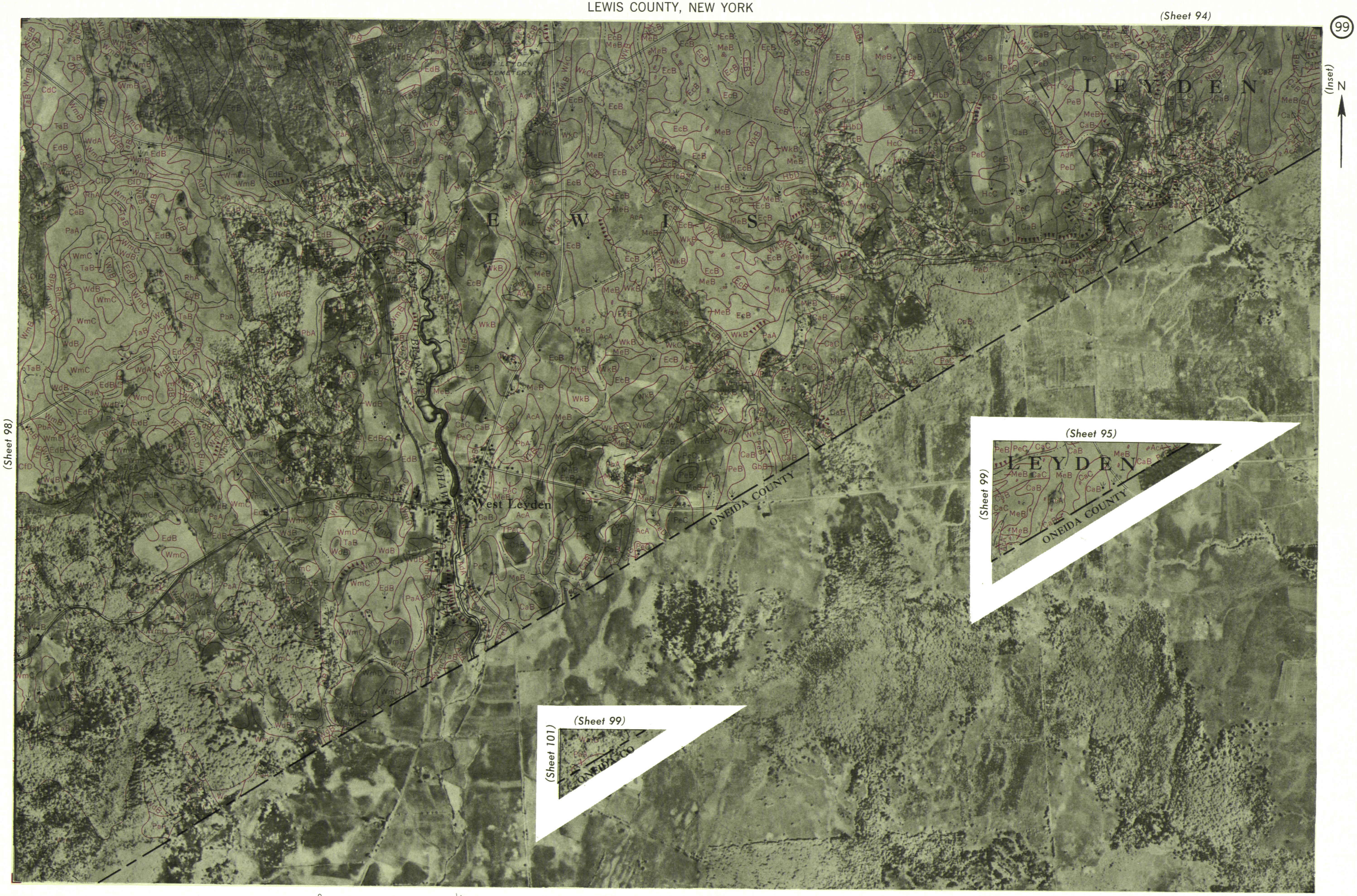

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LEWIS COUNTY, NEW YORK

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Roads

- Good motor
- Poor motor
- Trail
- Marker, U. S. — 33

Railroads

- Single track
- Multiple track
- Abandoned

Bridges and crossings

- Road
- Trail, foot
- Railroad
- Ferry
- Ford
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings

- School
- Church
- Station

Mine and Quarry

- Shaft
- Dump
- Prospect

Pits, gravel or other

Power line

Pipeline

Cemetery

Dam

Levee

Tank

Oil well

Windmill

Canal lock (point upstream)

BOUNDARIES

- National or state
- County
- Township, civil
- Township, U. S.
- Section line, corner
- City (corporate)
- Reservation
- Land grant

DRAINAGE

Streams

- Perennial
- Intermittent, unclass.
- Crossable with tillage implements
- Not crossable with tillage implements

Canals and ditches — CANAL, DITCH

Lakes and ponds

- Perennial
- Intermittent

Wells — flowing

Springs

Marsh

Wet spot

RELIEF

Escarpments

- Bedrock
- Other

Prominent peaks

Depressions — Large, Small

- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

Soil type outline and symbol	Dx
Gravel	
Stones	
Rock outcrops	
Chert fragments	
Clay spot	
Sand spot	
Gumbo or scabby spot	
Made land	
Erosion	
Uneroded spot	U
Sheet, moderate	S
Sheet, severe	SS
Gully, moderate	G
Gully, severe	GG
Sheet and gully, moderate	SG
Wind, moderate	
Wind, severe	
Blowout	
Wind hummock	
Overblown soil	
Gullies	
Areas of alkali and salts	
Strong	A
Moderate	M
Slight	S
Free of toxic effect	F
Sample location	• 26
Saline spot	+